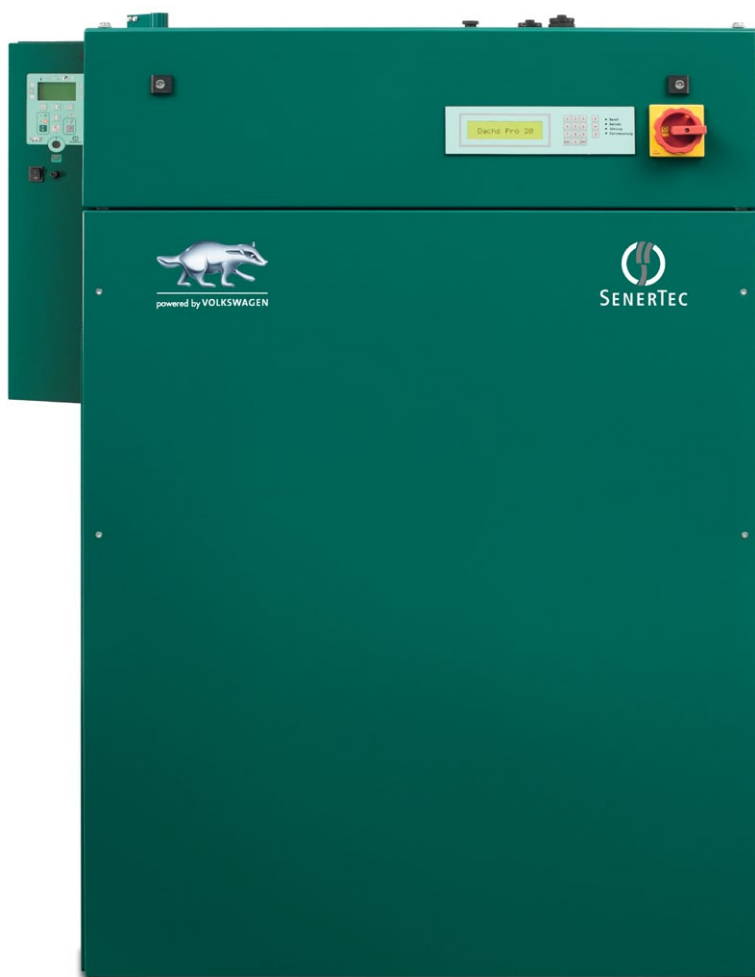
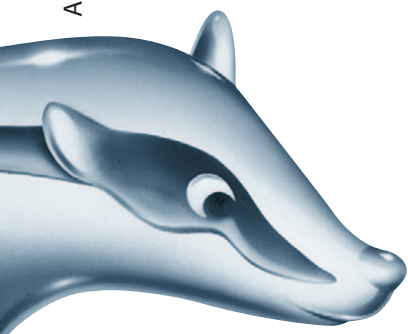




# Assembly, commissioning and operation **Dachs Pro 20 ST**



## **Supplement to the translation of the original German operating instructions VW EcoBlue 2.0 - Generation 1.2 of iav**



These instructions are intended for trained specialist staff.  
Before commencing your work at the Dachs Pro 20 ST, read these instructions carefully.  
In case of non-compliance, the warranty for any resulting damage will become void.  
The safety instructions are particularly important.



Applicable to: Assembly, commissioning and operation of Dachs Pro 20 ST with MSR Pro 20 ST  
Article no. 14/4798.495.002

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## 1 Introduction

### 1.1 General information

These instructions describe assembly, commissioning and operation of the Dachs Pro 20 ST overall system with the MSR Pro 20 ST controller unit.

These instructions are intended for authorised specialist staff assigned with assembly, commissioning and service, maintenance and repair of the VW EcoBlue 2.0 (Generation 1.2) and is a supplement to the existing VW documentation (iav).

These instructions serve installers as a “guideline” and additional documentation for complete installation of the Dachs Pro 20 ST overall system. For this reason, some chapters refer to the original VW operating instructions (iav).

The operator of the system may use these instructions as a source of information for necessary requirements and safe operation of the unit.

Carefully read these instructions before starting any work. The safety instructions are particularly important.

These instructions contain, among other things:

- The structure and individual modules of the Dachs Pro 20 ST overall system.
- Additional information on assembly of the Dachs Pro 20 ST overall system and the necessary preconditions involved.
- Notes on safe handling of the system.
- Description of the MSR Pro 20 ST controller unit and its operation.
- Commissioning instructions for the Dachs Pro 20 ST overall system.
- Check list for assembly and commissioning of the Dachs Pro 20 ST overall system.

#### Note:

The hydraulic and electrical diagrams are depicted as schematic diagrams only. Accessories required for hydraulics, safety and control technology must be provided and installed according to DIN, EN, and VDI regulations.

### 1.2 Additional documentation



#### Reference:

Before starting any work, please read the following applicable instructions and notes:

- 4798.492.xxx, *Dachs Pro 20 ST planning documentation*.
- 4798.522.xxx, *EcoBlue 2.0 (Generation 1.2) installation manual* - iav documentation of VW.
- 4798.530.xxx, *EcoBlue 2.0 (Generation 1.2) user manual* - iav documentation of VW.
- 4798.494.xxx, *MSR Pro 20 ST operation and configuration instructions*.
- 4798.497.xxx, *MSR Pro 20 ST brief instruction*.



- 4798.529.xxx, *Dachs Pro 20 ST customer information.*
- 4798.399.xxx, *SenerTec information brochure on heating water treatment.*
- 4798.496.xxx, *GSM modem for Dachs Pro 20 ST with MSR Pro 20 ST.*
- 4798.499.xxx, *Analogue modem module for Dachs Pro 20 ST with MSR Pro 20 ST.*
- *FAQ on Dachs Pro 20 ST*

### 1.3 Symbols used

The following symbols are used throughout the entire instructions. This symbol serves as a warning and highlights general hazards, necessary measures or helpful notes.



#### Attention! Danger:

This symbol warns against the risk of personal injury.



#### Attention:

This symbol warns against material and environmental damage.



#### Note:

This symbol highlights important additional information.



#### Reference:

This symbol highlights important documents.



internal cross-reference

The following symbols and typographic distinctions are used in this document:

#### Symbols:

- This symbol marks lists.
  - This symbol indicates actions to be taken.
1. Numbered lists mark action steps the order of which is important.

#### Typographic distinctions:

- `Commands and functions` are displayed in Courier New.
- *File names and save paths* are displayed in italics..
- **Warnings, notes, references, tips** and **emphases** are displayed in bold letters.



## 1.4 Abbreviations

DVGW	Deutscher Verein des Gas- und Wasserfaches [German association of the gas and water industry]	AC	Alternating current
FeuVO	Feuerungsverordnung [German ordinance on firing installations]	Oh	Operating hours
GS	Gas supplier	CHP	Combined heat and power generation (here also: CHP unit)
CHP	Combined Heat and Power	CAN	Controller Area Network
AEGS	Air-exhaust gas system	CO	Carbon monoxide
STB	Safety temperature limiter	DC	Direct current
TCR	Technical connection requirements	dB(A)	Sound pressure level with A-weighting
TI air	Technical instructions on air pollution control	EGS	Electronic gas safety controller
TRGI	Technical regulation for gas installations	EVU	Energy provider
DNO	Distribution network operator	IP	International Protection
F1-F7	Sensors F1 - F7	KFE	Boiler filling and discharge valve
PWM	Pulse width modulation (pump signal)	PSI	Buffer vessel interface

## 1.5 Responsibilities

### 1.5.1 Responsibilities of the installer

Disassembled transport as well as assembly, commissioning, service, maintenance and repair of the Dachs Pro 20 ST may only be carried out by authorised and certified specialist staff. Product training carried out by SenerTec or by a training institution commissioned by SenerTec is a minimum requirement. All work on the electrical equipment may only be carried out by trained electricians. Please also note the following:

- Before commencing any work, carefully read all provided instructions.



#### Reference:

Please observe the requirements and contents of the iav Documentation of VW in particular.

- During assembly and connection of the unit, adhere to the applicable regulations and standards.
- Check the unit prior to commissioning.
- Instruct the operator on how to operate the unit.
- Inform the operator about the necessity of regular maintenance and the consequences of any non-observance.
- Submit all documents supplied to the operator.



#### Attention:

Initial commissioning may only be implemented by the SenerTec customer service in cooperation with the VW customer service.



Prior to commissioning:

- A leakage test of the gas duct according to TRGI must be carried out.
- The exhaust gas system is to be approved by the responsible master chimney sweep, i.e. the authority responsible for inspecting gas installations (e.g. in the case of shared chimneys).
- A frost-protected operation of the unit is to be ensured. This means that suitable frost protection measures adapted to the ambient conditions have to be implemented.
- It is to be ensured that the heating water quality complies with the required specifications of the manufacturer.
- It is to be ensured that the fuel corresponds to the required gas category.

The installer is obliged to adhere to the national laws, regulations and standards of the respective country of the installation location. Among others, these include the following:

- The provisions of the applicable building law.
- The fire protection regulations.
- The technical requirements for the gas supply connection.
- The safety instructions in accordance with DIN, DVGW, VDE, TAB and the EU.
- Stipulations for the erection of power plants with a nominal voltage of up to 1000V.
- The operation of electrical units.



**Note:**

Outside of Germany, apart from national regulations, the international standard IEC 60364 *Electrical Installation of Buildings* is to be complied with.

### 1.5.2 Responsibilities of the operator

The operator is obliged to provide the necessary constructional requirements for assembly and commissioning as well as for safe and intended use of the systems.

Furthermore, the operator is obliged and solely responsible for the registration, notification and operation of the unit in accordance with applicable regulations.

#### Notification and authorisation obligation

Global and local regulations and TCR (technical connection requirements) of:

- Electric utility/distribution network operators (DNO)
- Gas suppliers (GS)
- Water authorities
- Chimney sweeps
- Building inspection
- Main customs office

are to be observed with regard to registration obligations. In case of technically justifiable deviations from these local regulations, an approval by the responsible supplier is to be obtained before installing the Dachs Pro 20 ST.



An application with the corresponding DNO is mandatory in Germany, for example. The stipulation of the required  $\cos \varphi$  is communicated to the applicant by the DNO once the connection has been approved (VDE-AR-N 4105).

**Note:**

The Dachs Pro 20 ST with its capacity is not subject to the German TI-air (<1MW) and does therefore not require any authorisation. As is the case for heating boilers of this size, there is no obligation of notification to the responsible authorities. The specifications of the applicable building code [Landesbauordnung in Germany] shall be authoritative.

### 1.5.3 Responsibilities of the manufacturer

Our Dachs products with CE mark have been developed and manufactured in accordance with the EC directives applicable at the time of inspection. This is confirmed by the manufacturer of the product in an EC declaration of conformity and by labelling the product with the CE mark.

Devices subject to the EC gas appliances directive have been tested and certified by the accrediting inspection authority indicated next to the CE mark by means of the respective ID number.

Subject to technical modifications.

The manufacturer will not assume any liability in the following cases:

- In case of non-compliance with the operating instructions of the unit (SenerTec as well as VW documentation).
- In case of insufficient maintenance and/or servicing of the unit.
- In case of non-compliance with the installation instructions and requirements for the unit.

The majority of countries do not have harmonised EU directives and regulations for the installation and commissioning of units in buildings. For this reason, when installing Dachs products, the responsible installation company has to adhere to the national laws, regulations and standards of the respective country.

**Reference:**

The declaration of conformity, certificates, approvals and manufacturer declarations on the Dachs Pro 20 ST can be found in the operator documentation folder or in the iav Documentation of VW.

**Warranty:**

Any warranty claim is subject to proper assembly as well as proper use/operation of the unit in accordance with applicable SenerTec and VW instructions as well as regular maintenance by trained and authorised specialists only.

**Disclaimer of warranty:**

In particular for damage which cannot be directly or indirectly traced back to the manufacturer, for example:

- Incorrect planning and assembly (e.g. fuel supply, hydraulic and electrical connections, exhaust gas evacuation).
- Commissioning, maintenance and repair by buyers or third parties.
- Natural wear and tear.
- Incorrect, improper treatment, alteration, repair.
- Unsuitable operating media, non-admitted lubricants.



- Use of unsuitable heating water.
- Chemical, electro-chemical and electric influences.
- Use of drinking water which does not correspond to the generally accepted rules of practice.

The warranty regulations of the General Terms and Conditions of SenerTec GmbH, Schweinfurt, in their respective current version shall apply.

## 1.6 Homologations

The Dachs Pro 20 ST with VW EcoBlue 2.0 (Generation 1.2) CHP unit complies with all applicable regulations of EU directives and has been designed, constructed and inspected according to the standards specified in the inspection reports.

### Reference:

The declaration of conformity, certificates, approvals and manufacturer declarations on the Dachs Pro 20 ST can be found in the operator documentation folder or in the iav Documentation of VW.

### Standards and regulations:

- DVGW VP 109 - Turn-key combined heat and power plants.
- DIN 6280 - Parts 14 and 15 - Combined heat and power system (CHPS) with reciprocating internal combustion engines.
- DIN V 19250 - Basic Safety Considerations for control and instrumentation technology equipment.
- DIN EN 298 - Automatic gas burner control systems for gas burners and gas burning appliances with or without fans.
- DIN EN 60730-1 /-2-5 - Automatic electrical controls for household and similar use.
- DIN EN 303-1 - Heating boilers with forced draught burners.
- DIN EN 60335-1 - Household and similar electrical appliances - Safety.
- DIN 4702 - Part 2 - Central heating boilers; test code.
- DIN V VDE 0126 - Automatic disconnection device between a generator and the public low-voltage grid.
- DIN EN 60068-2-1 / -2 / -30 - Environmental testing.
- DIN EN 61000-3-2 /-3 and DIN EN 61000-4-2 /-3 /-4 /-5 /-6 /-11 - Electromagnetic compatibility.
- DIN EN 61810-1 - Electromagnetic compatibility.
- DIN EN 60947-5-1 - Low-voltage switchgear and controlgear.
- DIN EN 61558-2-4 - Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V.
- VDE-AR-N 4105 - Generator units with low-voltage distribution networks - Technical minimum requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks.
- DIN V VDE V 0124-100 - Grid integration of generator plants - Low-voltage - Test requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks.
- DIN EN 50438 - Requirements for micro-generating plants to be connected in parallel with public low-voltage distribution networks.
- DIN EN 82079 - Preparation of instructions for use - Structuring, content and presentation - Part 1: General principles and detailed requirements.
- DIN VDE 0100 - Erection of low voltage installations - List of relevant standards and transitional dispositions.



**Reference:**

Please particularly observe standards, guidelines, regulations and legal requirements additionally specified in the iav documentation relevant for planning and installation.

**Note:**

In order to integrate the CHP technology into the buildings, standards/directives such as TRGI, TRF, TRWI, VDI 2035 are to be observed.

## 2 Safety

This chapter describes the general risks resulting from working with the Dachs Pro 20 ST as well as measures for preventing hazardous situations and how to react in the event of an accident.

All work on the unit, such as assembly, commissioning, servicing and repair, may only be carried out by certified and authorised specialist staff.

The unit has been designed in accordance with the statutory regulations applicable at the time of delivery and incorporates state-of-the-art safety technology. Any potential residual hazards are indicated by safety warnings and described in these instructions.

Please note the safety warnings attached to the machine. The machine may only be operated if all safety equipment is in place. Hazardous areas between the unit and equipment on site have to be secured. Regularly check all safety equipment, warning systems and automatic shutdowns.

Before initial commissioning, the exhaust gas system including safety equipment (e.g. CO sensors) is to be inspected for efficiency by a specialist engineer. Before commissioning, the electrical connections are to be checked by a certified specialist engineer. After any alteration to the unit including modifications of electrical or hydraulic connections, the inspection has to be repeated.


**Reference:**

Please particularly observe the safety requirements and contents of the iav Documentation of VW.

### 2.1 General safety instructions




The safety warnings highlight special risks occurring when handling combined heat and power units. Such risks may occur when operating a combustion engine (heat, moving parts, exhaust gas, noise) in connection with electrical equipment (danger of electrocution).

#### 2.1.1 Structure of the general safety instructions












 <b>Danger</b>	
Danger symbols	<p><b>Information on type and source of danger.</b></p> <p><i>Explanation and indication of the consequences of the risk.</i></p> <ul style="list-style-type: none"><li>• Information on avoiding the risk.</li></ul> <p><b>In case of emergency: Recommended behaviour in case of emergency.</b></p>



In the head line of general safety instructions, the following elements are used:

- 5  + **Danger** (red): Any non-compliance leads to death or severe injury.
- 5  + **Warning** (orange): Any non-compliance may lead to death or severe injury.
- 5  + **Caution** (blue): Any non-compliance may lead to personal injury.
- 5 **Caution** (blue): Any non-compliance may lead to environmental and material damage.

The following danger symbols are used:

	General danger		Danger due to moving parts		Harmful substances
	Electrical voltage / current		Hot surface		Corrosive substances
	Explosion hazard		Hot fluids and fumes		Environmental damage
	Lack of oxygen		Noise		



## 2.1.2 Work on electric and electronic equipment



### Attention! Danger:

Work on the electronic equipment may only be carried out by authorised specialist staff.

When working on electric equipment, the assembly and commissioning instructions as well as the instructions on the replacement of service and spare parts are to be adhered to. For personal safety, the prescribed connection requirements and precautions are to be complied with.

 <b>Danger</b>	
	<p><b>Risk of electrocution.</b></p> <p><i>Severe bodily harm or death may be the consequence.</i></p> <ul style="list-style-type: none"> <li>• Before commencing any maintenance and repair, the Dachs is to be de-energised.</li> <li>• A risk of electrocution persists even if the power generation of the unit has been interrupted.</li> <li>• De-energise the supply lines at the fuses of the main and sub-distribution.</li> <li>• Secure de-energised supply lines against reactivation.</li> <li>• Use a test device to ensure that the system has been de-energised.</li> </ul> <p><b>Seek medical assistance following an electric shock.</b></p>



### 2.1.3 Gas connection

**Attention! Danger:**

The gas line is a safety-relevant component and may only be mounted by authorised specialist staff.

The stipulations of DVFG-TRF 2012 are to be strictly adhered to.

A gas shut-off valve with thermal shut-off unit (TSOU) must be installed.

### 2.2 Intended use

The unit may only be operated according to its intended use as described in the present document.

Combined heat and power generation units (CHP), also referred to as micro CHP, are systems or units that work according to the principle of combined heat and power generation to simultaneously generate electricity and heat. The Dachs Pro 20 ST works according to this principle. However, it is designed for decentralised utilisation and application of the generated energies inside the building.




Any other functions or applications beyond this are regarded as not intended. SenerTec GmbH shall not assume any liability for any damage resulting from this unintended use. The operator shall bear the entire risk.

**Attention! Danger:**

The unit may only be operated according to its specified intended use. During system testing, the Dachs Pro 20 ST may only be operated with specified modules and approved system technology. Any unintended use may lead to personal injury or damage to the machine.

The following situations are regarded as incorrect operation:

- Operation with system technology not recommended by the manufacturer.
- Operation with fuels other than those specified and approved.
- Operation with machine settings changed by the operator.
- Operation with supply connections changed by the operator.
- Operations under ambient conditions other than those approved.




 <b>Danger</b>	
	<b>Risk of explosion caused by room air saturated with gas.</b>
	<b>Danger of suffocation caused by under-saturation of breathing air.</b>
	<i>Severe bodily harm or death may be the consequence.</i>
	<ul style="list-style-type: none"><li>• Immediately deactivate the unit as soon as you notice the smell of gas.</li><li>• Avoid open flames, do not smoke, do not operate any electrical switches or contacts.</li><li>• Interrupt the gas supply.</li><li>• Ensure fresh air supply.</li><li>• Check the connections and lines for leakage.</li><li>• Immediately repair any leakage.</li><li>• Notify the gas supplier if the leakage is upstream of the gas meter.</li></ul>
	<b>In case of non-controllable gas leakage, leave the hazardous area and notify the fire services.</b>







## 2.3 Special safety instructions

### 2.3.1 Machine in running operation

After being switched on, the machine starts automatically and parts are put in rotation. Among other things, the exhaust gas flow contains nitrogen oxides and carbon monoxide. Engine components and the exhaust gas system heat up considerably. If the machine is operated while the acoustic enclosure is open (e.g. for test purposes), the noise level is hazardous to health.

 <b>Danger</b>	
  	<p><b><i>Danger of suffocation caused by exhaust gas which has not been discharged.</i></b></p> <p><i>Severe bodily harm or death may be the consequence.</i></p> <ul style="list-style-type: none"> <li>• Immediately deactivate the unit as soon as you notice the smell of exhaust gas.</li> <li>• Ensure sufficient fresh air supply.</li> <li>• Check the exhaust gas system for leakage.</li> <li>• Immediately repair any leakage.</li> </ul> <p><b>In case of any physical impairment, immediately contact the emergency medical assistance service.</b></p>

 <b>Warning</b>	
	<p><b><i>Danger of burns caused by hot surfaces.</i></b></p> <p><i>Severe burns may be the consequence.</i></p> <ul style="list-style-type: none"> <li>• Before commencing any work, wait for the machine to cool down.</li> <li>• Wear gloves.</li> </ul> <p><b>Cool burnt areas and seek medical assistance for further treatment of the wound.</b></p>

 <b>Warning</b>	
	<p><b><i>Danger of burns caused by hot fluids and fumes.</i></b></p> <p><i>Severe burns may be the consequence.</i></p> <ul style="list-style-type: none"> <li>• Please note that overpressure in the system may lead to hot steam escaping from the safety valves.</li> <li>• Please note that circulating fluids (heating water, cooling water, solar fluid) heat up considerably.</li> <li>• Wear gloves.</li> </ul> <p><b>Cool burnt areas and seek medical assistance for further treatment of the wound.</b></p>



### Warning



***Danger of accidents caused by missing safety equipment.***

*Unauthorised changes to the system may lead to severe injuries.*

- Check the electrical and mechanical safety equipment before operating the unit.
- Do not operate the machine if the flywheel cover is not installed.
- Do not carry out any changes to the safety equipment.

**In case of injury, immediately seek medical assistance.**



### Caution



***Danger caused by machine noise.***

*Hearing impairment may be the consequence.*



- Wear hearing protection when working on the running machine.



**Seek medical assistance if you notice any impairment to your sense of hearing.**





### 2.3.2 Assembly and repair

Some Dachs Pro 20 ST components exceed the maximum recommended load to be lifted by individual persons. These include pre-mounted components on delivery as well as some spare parts. When working with heavy loads, lifting devices are to be used and difficult to move parts to be secured.

 <b>Warning</b>	
	<p><b>Risk of injury due to sharp edges.</b></p> <p><i>Cutting injuries may be the consequence.</i></p> <ul style="list-style-type: none"> <li>• Always wear gloves when carrying sharp machine, cladding and housing components.</li> </ul> <p><b>Seek medical assistance after initial treatment of the wound.</b></p>



 <b>Caution</b>	
	<p><b>Danger caused by excessive weight of machine components.</b></p> <p><i>When working on the machine, the maximum lifting loads may not be exceeded.</i></p> <ul style="list-style-type: none"> <li>• Use lifting equipment.</li> <li>• Work with others.</li> </ul> <p><b>Seek medical assistance if you notice any impairment due to heavy lifting.</b></p>


 <b>Caution</b>	
	<p><b>Danger caused by insufficient light at the workstation.</b></p> <p><i>Increased risk of injury.</i></p> <ul style="list-style-type: none"> <li>• Ensure that no lamps are damaged.</li> <li>• Only work with sufficient lighting.</li> </ul>



### 2.3.3 Servicing

When operating the Dachs Pro 20 ST, acidic condensate forms. Condensate and waste products from the neutralisation process (e.g. when using the SenerTec neutralisation box) has to be handled appropriately. Unit-specific safety regulations depend on the functional principle of the device type used.

 <b>Warning</b>	
	<p><b><i>Danger of chemical burns caused by acids and alkaline solutions.</i></b></p> <p><i>Chemical burns may be the consequence.</i></p> <ul style="list-style-type: none"><li>• Wear protective glasses when transferring condensate.</li><li>• Wear gloves when handling the condensate.</li><li>• Condensate is to be properly disposed of.</li></ul> <p><b>Thoroughly rinse eyes with clear water. Rinse off exposed skin surfaces with plenty of clear water. Seek medical assistance for follow up treatment.</b></p>

<b>Caution</b>	
	<p><b><i>Danger due to waste oil, filling and operating media.</i></b></p> <p><i>Environmental damage may be the consequence.</i></p> <ul style="list-style-type: none"><li>• Waste oil, filling and operating media (such as glycol, acidic condensate) is to be properly disposed of.</li></ul>



#### **Attention:**

The safety information specified in chapter 2 of these instructions are a rough overview of potential safety risks at the Dachs Pro 20 ST overall system. Please observe the detailed safety instructions in the individual chapters and applicable documentation.



#### **Reference:**

Please particularly observe the safety requirements and contents of the iav Documentation of VW concerning the EcoBlue 2.0 (Generation 1.2).



## 3 Technical specifications

### 3.1 Technical data

The technical data refer to the Dachs Pro 20 ST overall system including Volkswagen EcoBlue 2.0 (Generation 1.2) CHP unit in combination with the MSR Pro 20 ST system controller, 2 SE940 buffer vessels and one frequency converter.

#### Reference:



The specified values serve as basis for projecting.  
For the full technical data of the Dachs Pro 20 ST, please refer to the *Dachs Pro 20 ST technical data sheet*, art. no. 4798.493.xxx.

#### 3.1.1 Dachs Pro 20 ST overall system

Tab.1: Technical data - Dachs Pro 20 ST overall system (excerpt)

Overall system general parameters	
Operating mode	Grid parallel operation
Fuel	Natural gas (H/L) according to DVGW G 260
Gas appliance type	B <sub>23P</sub>
Noise emission (sound pressure level according to DIN 60804)	< 50 dB (A)
Flow temperature - Dachs outlet connection	max. 90 °C
Return temperature - Dachs inlet	min. 30 °C, max. 70 °C
Ambient air temperature (installation site)	min. 5 °C, max. 40 °C
Electrical connection	400 V AC / 50 Hz / cosφ = 0,95
Dimensions and weights	
Length / Width / Height of CHP unit	approx. 117 / 90 / 175 cm
Length / Width / Height of CHP unit with MSR Pro 20 ST	approx. 135 / 90 / 175 cm
Empty weight of CHP unit	approx. 800 kg
Diameter / Height 1 SE940 buffer vessel	approx. 100 / 212 cm
Weight 1 SE940 buffer vessel (empty/filled)	approx. 170 / 1110 kg
Overall system installation dimensions (L / W / H)	approx. 310 / 240 / 220 cm (buffer vessel length side) approx. 340 / 210 / 220 cm (buffer vessel broad side)



Fig. 1: Dachs Pro 20 ST overall system





## 3.1.2 Volkswagen EcoBlue 2.0 (Generation 1.2) CHP unit

Tab.2: Technical data: Volkswagen EcoBlue 2.0 (Generation 1.2) CHP unit

General unit parameters	
Device category	DE I <sub>2ELL</sub>
Gas type (natural gas according to DVGW G 260)	H/L
Methane number	> 80
Electrical net efficiency <sup>1</sup>	32.9 %
Thermal efficiency <sup>1</sup>	61.8 %
Overall efficiency	94.7 %
CHP coefficient	0.53
Electrical net capacity <sup>1</sup>	19.2 kW
Thermal capacity <sup>1</sup>	36.1 kW
Heating output of the fuel gas <sup>1</sup>	58.4 kW
Connection pressure range	18 - 25 mbar
Series fuse (gG)	50 A
Connection diameter (grid connection)	max. 5 x 16 mm <sup>2</sup>
Rated generator current (motor) I <sub>N Mot</sub> <sup>2</sup>	36.7 A
Compensating capacitor capacity <sup>2</sup>	12.1 kVar
Electrical protection type acc. to DIN VDE 0470	IP 20
Primary energy savings according to EU RL 2004/8/EC <sup>3</sup>	26.2 %
Total annual efficiency according to EU RL 2004/8/EC <sup>3</sup>	94.7 %
Electrical unit parameters	
Voltage	400 V
Current type	3 N~
Frequency	50 Hz
System power factor, inductive (calculated)	min. 0.95
System input current (regenerative) I <sub>N</sub>	29.2 A
Starting current <sup>4</sup>	50 A
Air inlet unit parameters	
Fresh air demand for combustion	min. 80 kg/h
Ventilation opening size at installation site according to DVGW G600	min. 170 cm <sup>2</sup>
Exhaust gas unit parameters	
Exhaust gas flow at the nominal operating point at exhaust back pressure <sup>5</sup>	≤ 80 kg/h 10 mbar
Exhaust gas flow at exhaust back pressure <sup>5</sup>	max. 85 kg/h 10 mbar
Admissible exhaust back pressure <sup>5</sup>	max. 50 mbar
Exhaust gas temperature at power unit output <sup>5</sup>	160 °C
NO <sub>x</sub> value	15 mg/Nm <sup>3</sup> , 5 % O <sub>2</sub>
CO value	38 mg/Nm <sup>3</sup> , 5 % O <sub>2</sub>
Compliance with requirements ½ TI air	yes <sup>6</sup>

<sup>1</sup> Values refer to natural gas H or test gas G20 and standard conditions according to ISO 3046

<sup>2</sup> According to component data sheet

<sup>3</sup> at 100 % own consumption

<sup>4</sup> Max. half period effective value with frequency converter, based on the inspection report by IWES Institut Kassel according to VDE-AR-N 4105:2011-08

<sup>5</sup> Downstream of CHP exhaust gas system flange to peripherals

<sup>6</sup> NO limit value<sub>x</sub> 125 mg/Nm<sup>3</sup>, 5 % O<sub>2</sub>, CO limit value 150 mg/Nm<sup>3</sup>, 5 % O<sub>2</sub>

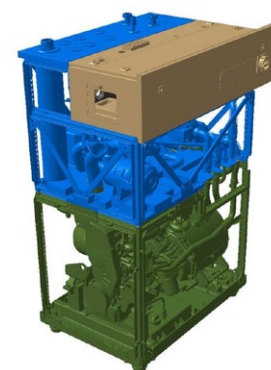
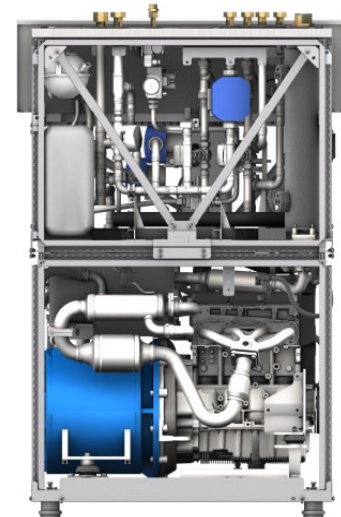


Fig. 2: EcoBlue 2.0 figures

### Reference:

The specified values serve as basis for projecting. The values of the respective manufacturer's documentation of VW (iav) shall apply.





### 3.1.3 MSR Pro 20 ST system controller

Tab.3: Technical data - MSR Pro 20 ST system controller

Electrical connection	L/N/PE 230 V~ / 50 Hz
Protection type (EN 60529)	IP 40
Protection class (DIN 57700)	Protection class 1
Ambient air temperature (installation site)	min. 5 °C, max. 40 °C
Assemblies <ul style="list-style-type: none"> <li>• Display unit</li> <li>• Logics unit</li> <li>• Power board</li> </ul>	Keypad with LCD display Control board with interfaces Power PCB with connections for sensors, actuators, etc. Terminals for grid connection
Height / Width / Depth	approx. 75 / 33.5 / 17.5 cm
Weight	approx. 12 kg



Fig. 3: MSR Pro 20 ST figures

### 3.1.4 2 × SE940 buffer vessels

Tab.4: Technical data - SE940 buffer vessel

Vessel capacity	2 × approx. 940 litre capacity
Additional heating water capacity	max. 95 °C
Admissible operating pressure	PN 3 bar
Polyester fleece insulation	10 cm on PS foil
Dimensions (diameter x height) without / with insulation	approx. 79 x 201 cm / approx. 100 x 212 cm each
Buffer vessel tilted dimensions	approx. 216 cm
Weight <ul style="list-style-type: none"> <li>• Empty and without insulation</li> <li>• Filled and with insulation</li> </ul>	approx. 170 kg each approx. 1110 kg each



Fig. 4: SE940 buffer vessel figures

### 3.1.5 Frequency converter

Tab.5: Technical data - Frequency converter

Manufacturer	Lenze
Model	E84AVHCE1534xXx
Connections	Control line, supply to and return from CHP
Height / Width / Depth	approx. 50 / 40 / 22 cm
Weight	approx. 15 kg



Fig. 5: Frequency converter figures

### 3.1.6 Accessories and communication

Tab.6: Accessories and communication data

2 × CO sensor
Buffer discharge pump with shut-off set and thermometer
TOTAL FILTER TF1 (magnetite filter, Fernox)
Connection set for gas and heating water
GSM modem for MSR Pro 20 ST
(optional analogue modem for MSR Pro 20 ST instead of GSM modem)



Fig. 6: Figures of accessories and communication



## 3.2 Dimensions and connections

### 3.2.1 VW EcoBlue 2.0 (Generation 1.2) dimensions and connections

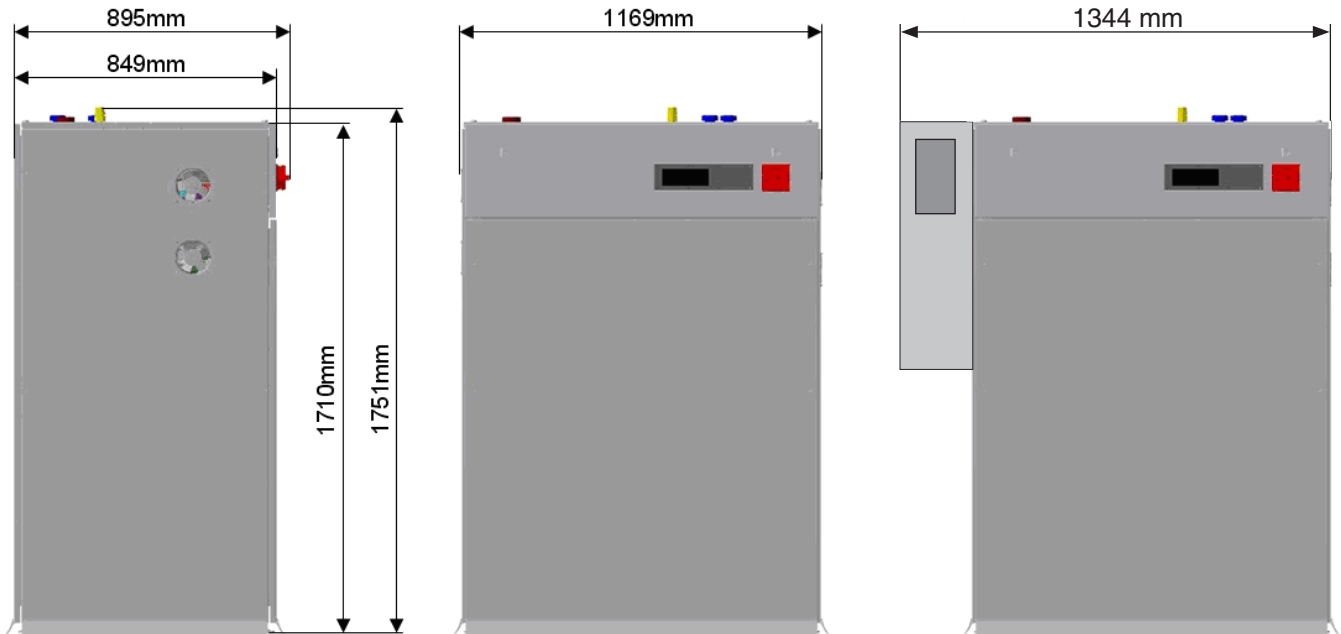


Fig. 7: Dimensions of EcoBlue2.0 with cladding

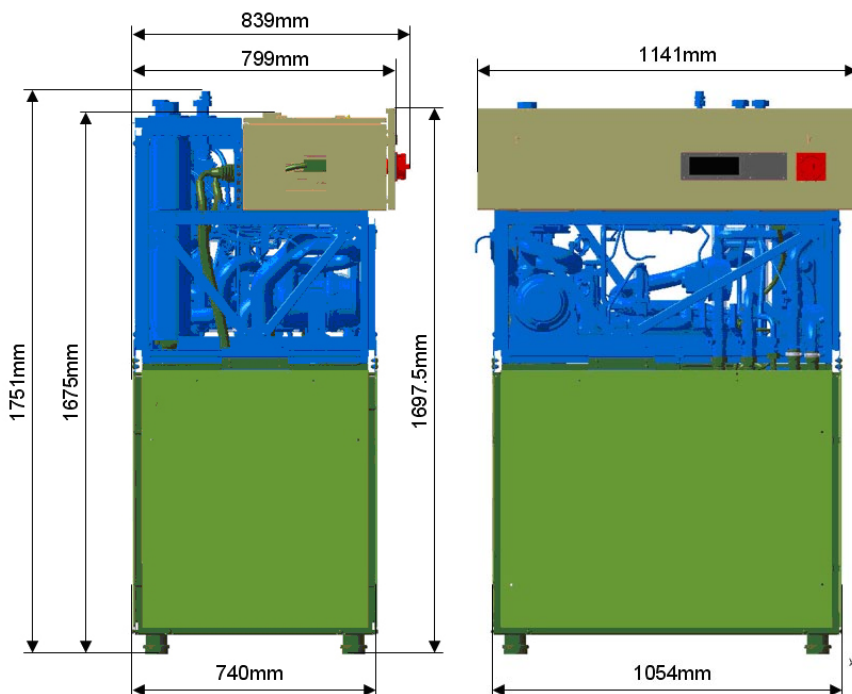


Fig. 8: EcoBlue2.0 dimensions without cladding

- ① Gas connection
- ② Electronic ports (e.g. CAN)
- ③ Frequency converter supply
- ④ Frequency converter return
- ⑤ Fuel connection (gas connection)
- ⑥ Dachs outlet connection  
(flow to buffer)
- ⑦ Dachs inlet (return from buffer)
- ⑧ VW EcoBlue 2.0 grid connection

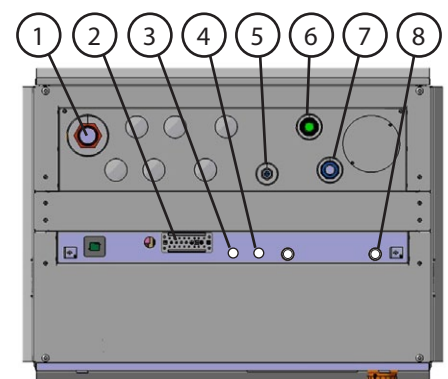


Fig. 9: EcoBlue 2.0 main connections

#### Reference:

For detailed information on the dimensions and connections of VW EcoBlue 2.0, please refer to the *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx - **Chapter 5.2**.



### 3.2.2 Buffer vessel SE940 dimensions and connections

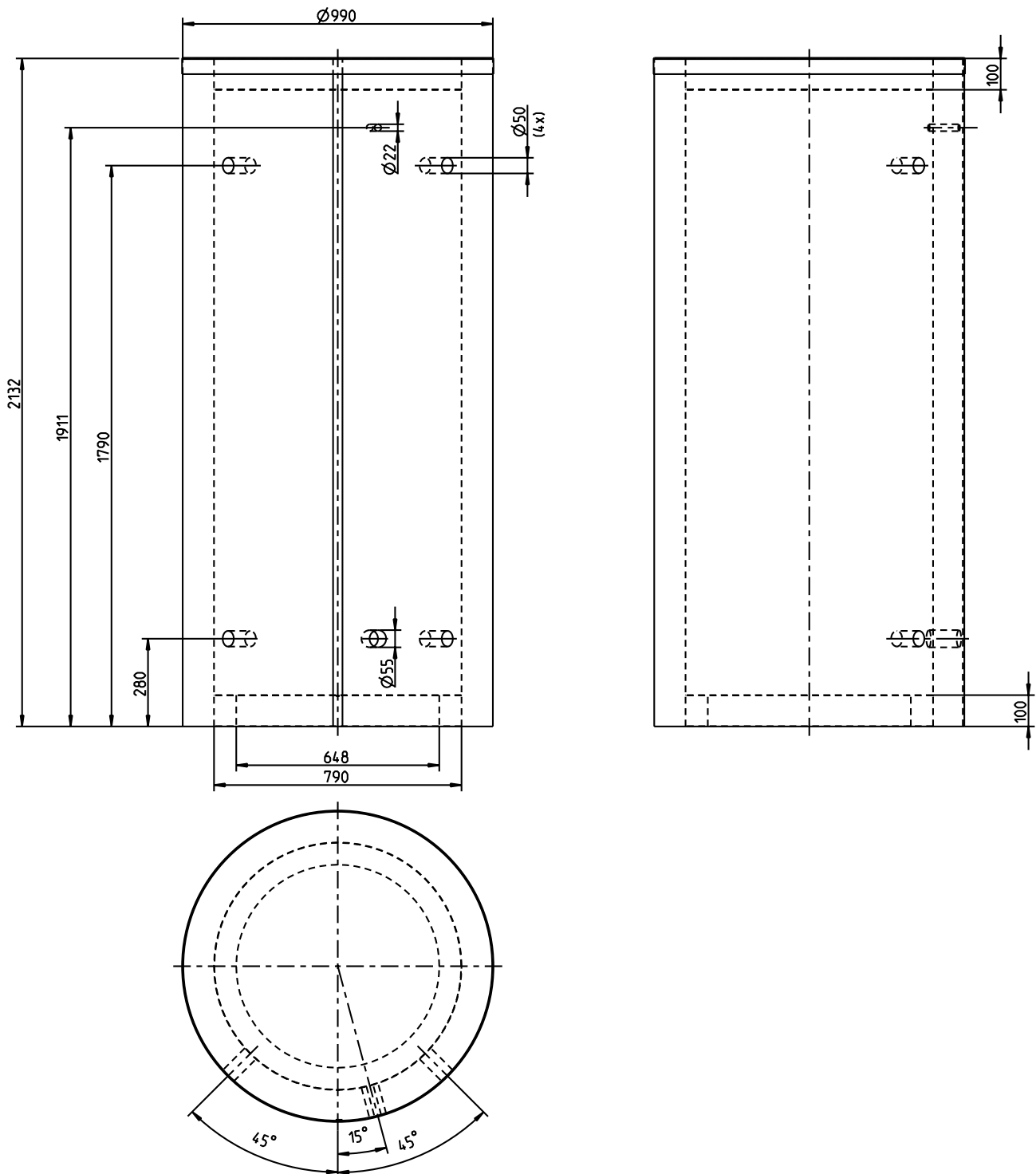


Fig. 10: Dimensions Buffer vessel SE940 (complete)

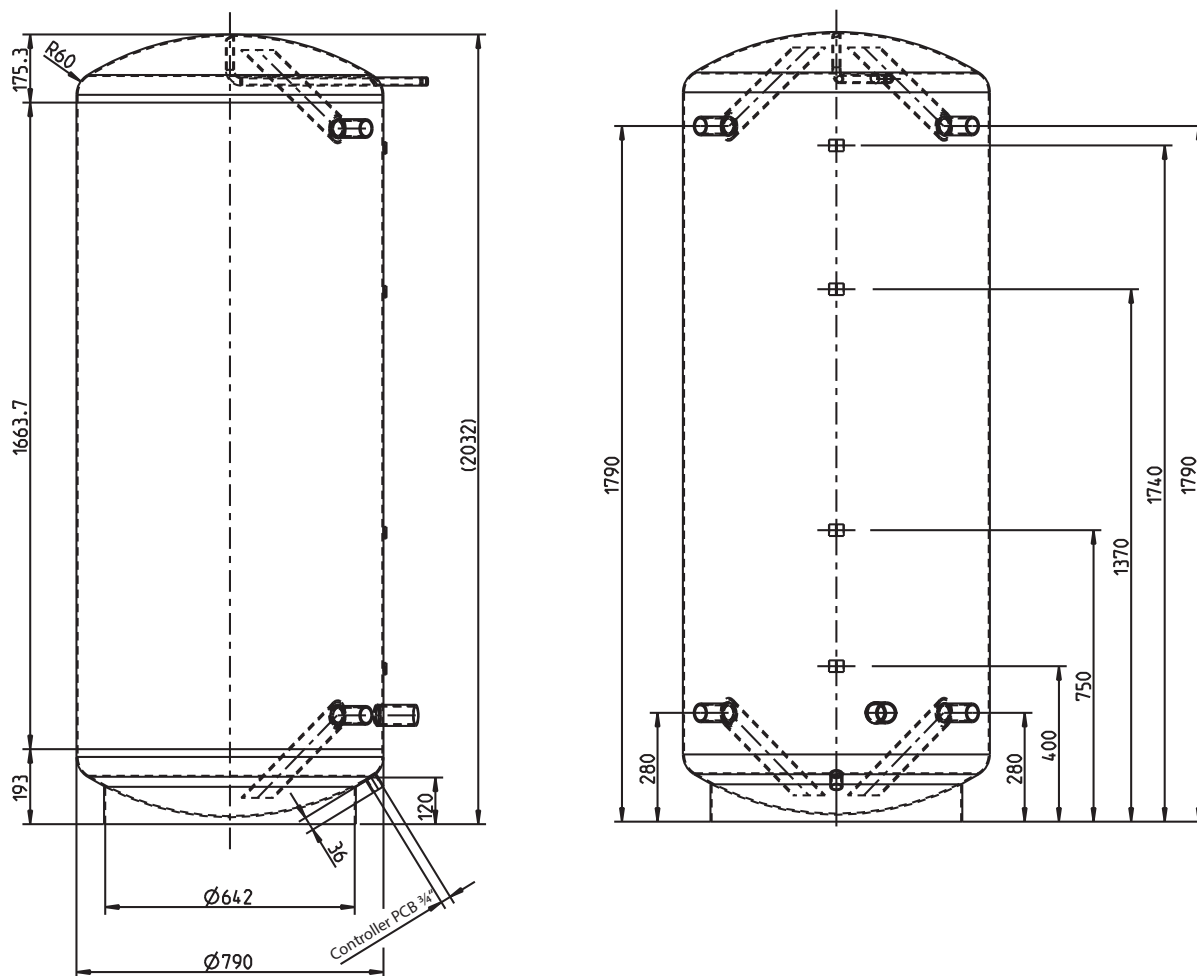


Fig. 11: Dimensions Buffer vessel SE940 (raw part)

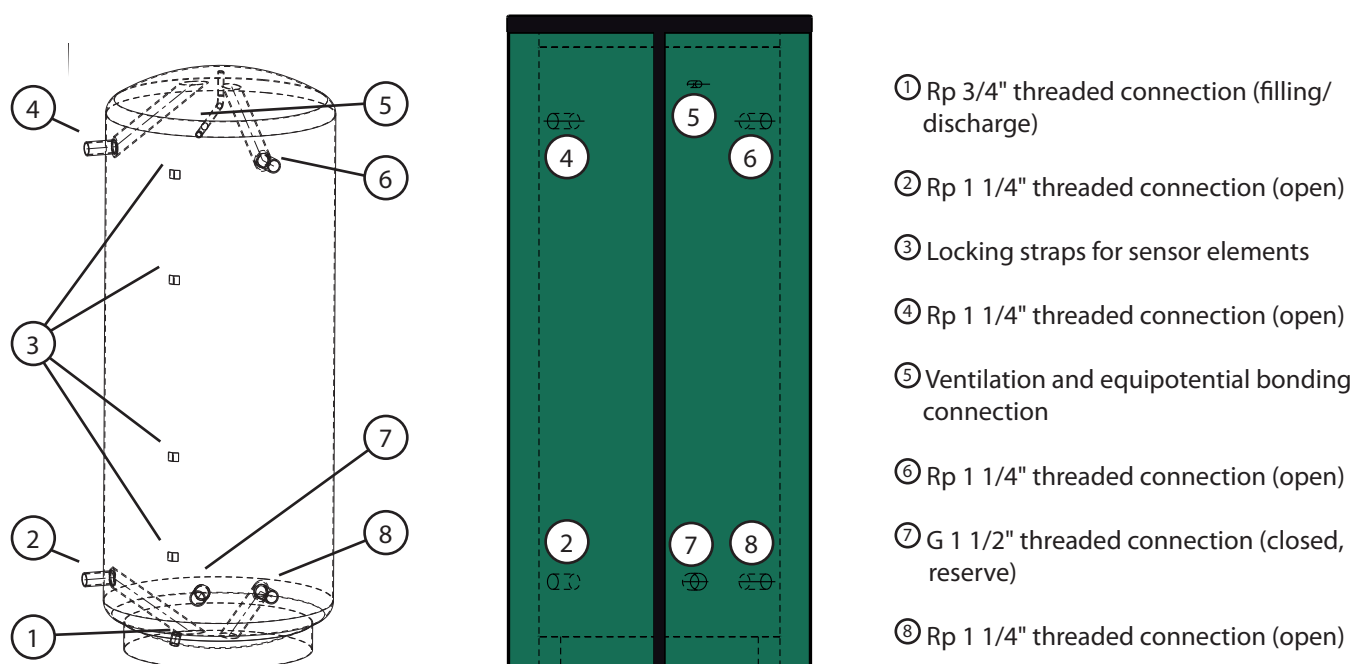


Fig. 12: Buffer vessel SE940 connection



### 3.3 Circuit diagram

#### Internal MSR Pro 20 ST controller wiring diagram

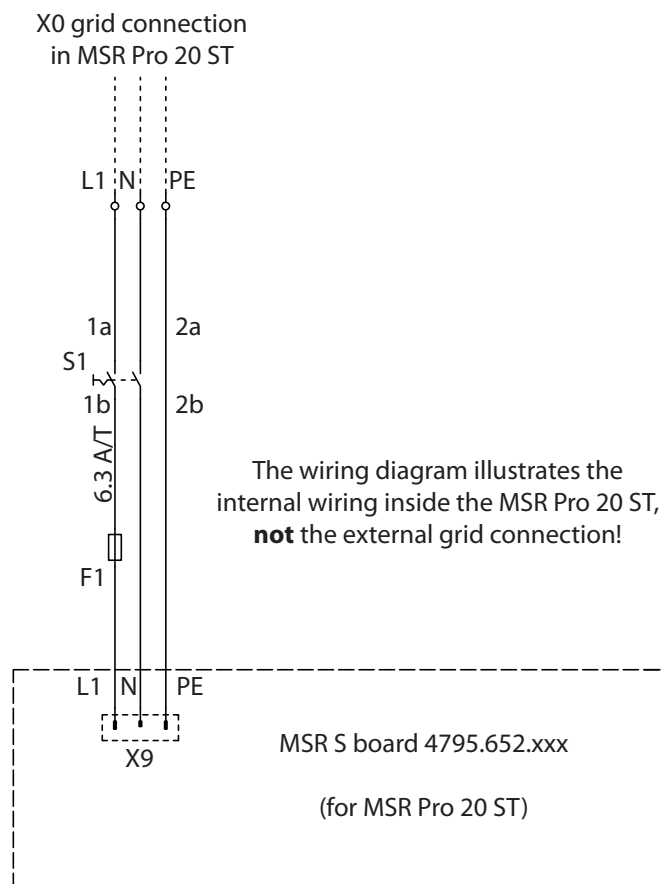


Fig. 13: Internal MSR Pro 20 ST controller wiring diagram

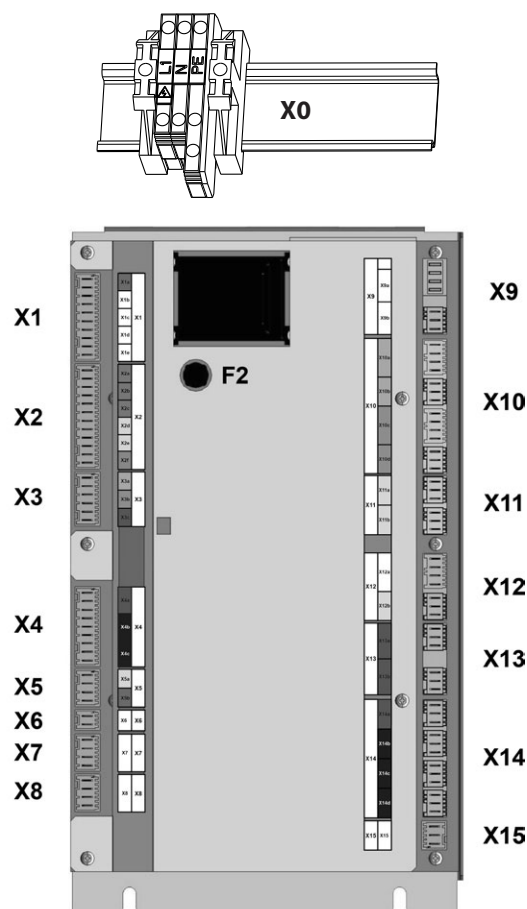


Fig. 14: Connections in the MSR Pro 20 ST controller

#### VW EcoBlue 2.0 (Generation 1.2) wiring diagram

##### Reference:

The detailed circuit diagram of the VW EcoBlue 2.0 (Generation 1.2) is available as PDF for download in the partner area of the SenerTec website.



The most important sections of the detailed circuit diagram are summarised in document *Extract from the EcoBlue 2.0 (Generation 1.2) circuit diagram for Dachs Pro 20 ST*, art. no. 4798.537.xxx and available in the operator files folder.

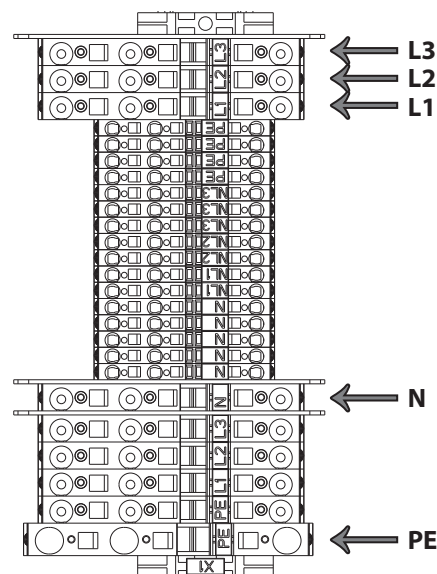


Fig. 15: X1 grid connection in CHP



## 4 Product description

### 4.1 Product information

Using the new Dachs Pro 20 ST, the energy costs in buildings with high heat and power consumption can be efficiently lowered in a climate-friendly way. The Dachs Pro 20 ST generates power and heat in one process according to the principle of combined heat and power generation (CHP), directly where it is consumed. By making use of the utilised fuel twice, resource consumption as well as CO<sub>2</sub> emissions can be considerably reduced in comparison to separate energy supply systems. The power generated during heating can be used by the operators themselves and excessive power can be sold and fed into the public grid.

The particularly efficient combined energy generation is supported politically. Consequently, Dachs Pro 20 ST operators may expect financial benefits. For every kilowatt hour generated by the Dachs Pro 20 ST, a statutory bonus of 5.41 cents is awarded. This is independent of whether the energy is used directly on site or sold for additional earnings under market conditions and fed into the grid. Furthermore, the fuel used by CHP units is not subject to energy tax. For units up to an electrical capacity of 20 kW, owners may expect an investment subsidy by the German Federal Office for Economic Affairs and Export Control (BAFA).

#### More benefits and service for operators

- Integration in any existing heating system
- Energy centre for power and heat
- Maintenance and service codes (to the installer)

As a small scale power plant that is as powerful as it is efficient, the Dachs Pro 20 ST lends itself to the supply of large apartment buildings from twelve residential units and commercial operations. By means of local heat networks, multiple buildings can also be supplied with climate-friendly and cost-efficient CHP energy. Consequently, the Dachs Pro 20 ST is also an economic, modern and particularly future-oriented alternative for the energy supply of communities and the portfolio of energy providers.

#### Dachs Pro 20 ST applications for use

The Dachs Pro 20 ST is an efficient and optimally aligned system especially developed for the requirements of larger buildings. It can be used optimally and efficiently in commercial, communal and residential buildings with an annual heat consumption of more than 200000 kWh. The annual electricity consumption should exceed 40000 kWh. By means of local heat networks, multiple buildings can also be supplied with climate-friendly and cost-efficient CHP energy. Consequently, the Dachs Pro 20 ST is also a modern and particularly future-oriented alternative for the energy supply of communities and in the portfolio of energy providers.



#### Reference:

Further information can be obtained from:  
*Dachs Pro 20 ST planning manual*, art. no. 4798.492.xxx.



#### Note:

The Dachs Pro 20 ST can currently only be operated as a single-module unit; however, operation in a cascade (multi-module technology) is to be implemented in the future.





## 4.2 Operating principle

The Dachs Pro 20 ST is a typical application in the field of **cogeneration of heat and power**. A **four-cylinder 4-stroke engine** drives a water-cooled **asynchronous generator**. The generated mechanical energy is directly converted into electricity. Simultaneously, the heat generated by the drive is not eliminated as in conventional power plants, but utilised by transfer into a heating system.

Thanks to this cogeneration of heat and power, the fuel (natural gas) can be utilised much more efficiently than in standard generation solutions in separate units. As the conversion of primary energy takes place in a **circular process**, only 25 – 30 % of the deployed energy is transferred into mechanical movement. The remaining 70 – 75 % is converted into heat which is then transferred into a heating or domestic hot water process via respective heat exchanger systems. The overall efficiency increases respectively to approx. **90 %**, efficient utilisation of primary energy is maximised and a **primary energy saving** of approx. 30 % in contrast to separated generation of power and heat can be achieved.

During operation of the Dachs Pro 20 ST, up to 19.2 kW of electrical and 36.1 kW of thermal energy are provided.



### Reference:

Further information can be obtained from:  
*Dachs Pro 20 ST planning manual*, art. no. 4798.492.xxx.

The system is controlled by the internal controllers of the CHP unit in combination with the **MSR Pro 20 ST controller unit**. Both controllers have been specially developed for the requirements of the Dachs Pro 20 ST and fulfil the following tasks:

- Start and operation of the Dachs Pro 20 ST.
- Feed of electrical energy into the public grid and building systems.
- Feed of thermal energy into the heating system.
- Monitoring of the operational parameters of the Dachs Pro 20 ST.
- Monitoring of the electrical energy feed into the grid.
- Monitoring of the electrical safety during operation in case of grid or phase defects (safety chain).
- Control of fuel supply.

### Note:

The MSR Pro 20 ST controls the overall system, adjusts the buffer discharge pump for optimum buffer loading and discharge and provides additional control functions. However, it does **not** monitor safety-relevant functions regarding gas safety and automatic circuit breaker operation (ENS). These functions are performed by the internal controller of the CHP unit.



Heating circuit and hot water functions as well as control of a peak buffer are not supported by the MSR Pro 20 ST controller. These functions must be implemented via the existing heating control unit or an external controller. During the system test phase, the multi-module function of the MSR Pro 20 ST is not supported.

The MSR Pro 20 ST controller offers different user levels. In open accessible operator mode, operating data can be displayed and settings changed. The password-protected user levels enable adjustment of the control behaviour of the unit to special individual requirements and situations.





## System advantages for planners and installers:

- Reduced time for planning, assembly and commissioning.
- Coordinated system components with clearly defined interfaces for hydraulic and exhaust gas control provide safety during planning and assembly.
- Overall system solution with building heating and simultaneous electricity generation.
- Advanced and intelligent system control technology.
- Simple layout for easy assembly with clear interfaces.
- Optimum space utilisation thanks to compact design.

## 4.3 Main components

### 4.3.1 Dachs Pro 20 ST overall system

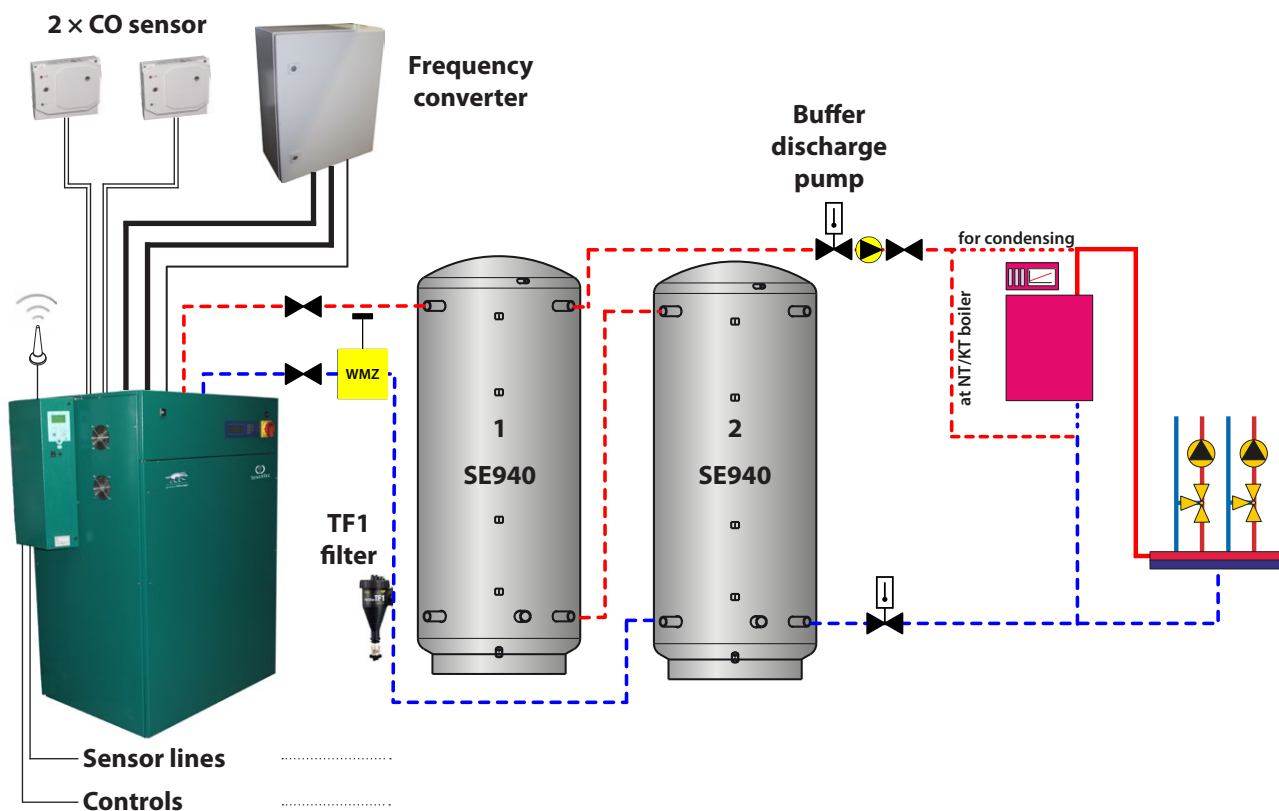


Fig. 16: Schematic overview - Dachs Pro 20 ST overall system



#### 4.3.2 CHP unit (VW EcoBlue 2.0 - Generation 1.2)

##### Engine technology

For the engine of the Dachs Pro 20 ST, SenerTec relies on the expertise of Volkswagen AG and uses the Volkswagen EcoBlue 2.0 (Generation 1.2) with the tried and tested four-cylinder line engine type: VW CNG 2.0.



Fig. 17: VW EcoBlue 2.0

#### 4.3.3 MSR Pro 20 ST

##### Control

The Dachs Pro 20 ST is controlled intelligently and easily via the MSR Pro 20 ST system controller developed by SenerTec.



Fig. 18: MSR Pro 20 ST

#### 4.3.4 2 × SE940 buffer vessels

##### Heat storage

the **two** SE940 buffer vessels have been developed by SenerTec to store the generated thermal energy during the system test phase of the Dachs Pro 20 ST.



Fig. 19: SE940 buffer vessel (raw/with insulation)

#### 4.3.5 Frequency converter

The Lenze frequency converter (model: E84AVHCE1534xXx) is required to reduce the switching currents during start-up of the CHP unit.



Fig. 20: Frequency converter (closed/open)



## 4.4 Control panel description

### 4.3.6 MSR Pro 20 ST

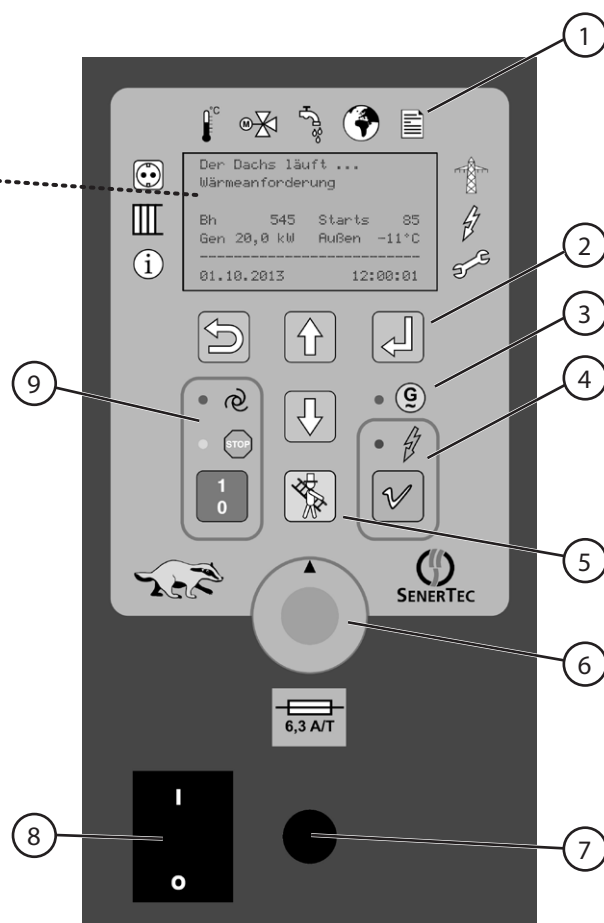

















Fig. 21: MSR Pro 20 ST control panel

- 1 Menu bar
- 2 Control keys
- 3 Generator LED
- 4 Fault clearance key and errorLED
- 5 Chimney sweep key
- 6 Infrared interface
- 7 MSR Pro 20 ST fuse (6.3 A/T, incl. connected system technology)
- 8 MSR Pro 20 ST main switch (incl. connected system technology)
- 9 ON/OFF key, STOP LED, automatic mode LED
- 10 Display

#### Menu functions

 Operating data	 Communication
 Heat demand	 Settings
 Electrical demand	 Grid
 Temperatures	 Service code
 Heating circuits	 Service
 Domestic hot water	

#### Control key function

	back
	up
	confirm
	down

The MSR Pro 20 ST controller is controlled via the key pad. The menu is navigated exclusively with the control keys. The current status is indicated in the display. When selecting a menu point, the respective symbol is marked in the display by means of an arrow. There are three access levels with different access rights. In order of the extended access rights, these levels are:

- **The operator level.**
- **The extended operator level.**
- **The service level.**



#### 4.4.1 CHP unit control panel



Fig. 22: CHP unit control panel

##### Reference:

For the detailed description of the CHP unit control panel, please refer to the iav documentation of VW.



- *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx
- *EcoBlue 2.0 (Generation 1.2) user manual for Dachs Pro 20 ST*, art. no. 4798.530.xxx.

The control display is located at the front of the CHP unit, in the top right.

**The control display provides the following components (illustrated with ① to ④ in the figure).**

##### ① Touch display

The touch display shows all available variables, measurements and parameters aligned in a menu structure. The menu structure can also be navigated without using the input and menu control keys by touching the touch display (see below).

If the background lighting is switched off, it can be turned on by touching the touch display or by pressing any key. If no control element is pressed for two minutes, the background lighting is automatically switched off again.

At the right of the touch display, a navigation bar is permanently displayed with up to four buttons (depending on the current screen):



Press this button to scroll upwards on the current screen.



Press this button to scroll downwards on the current screen.



Press this button to exit the current screen.



Press this button to apply any entries.




### ② Input keys


With the input keys, sub-menus and individual messages in sub-menus can be accessed directly. This field includes:

- The number keys from 0 to 9 to enter numeric values and
- the two input keys ESC and ENT.



Press this key to exit the current screen. This key has the same function as the  button in the navigation bar of the touch display.




Press this key to apply any entries. This key has the same function as the  button in the navigation bar of the touch display.


### ③ Menu control keys

Press the menu control keys to scroll through the menus.



Press this key to scroll upwards on the current screen. This key has the same function as the  button in the navigation bar of the touch display.



Press this key to scroll downwards on the current screen. This key has the same function as the  button in the navigation bar of the touch display.



This key is only used in sub-menus available to specialist personnel.

### ④ Status LEDs

The four Status LEDs indicate the operating status of the CHP unit.

- The green **Ready** LED flashes if the CHP unit is operational or in operation.
- The green **Operation** LED flashes if the CHP unit is in operation.
- The red **Fault** LED indicates a major fault.
- The blue **Remote control** LED flashes if the CHP controller is in automatic mode.

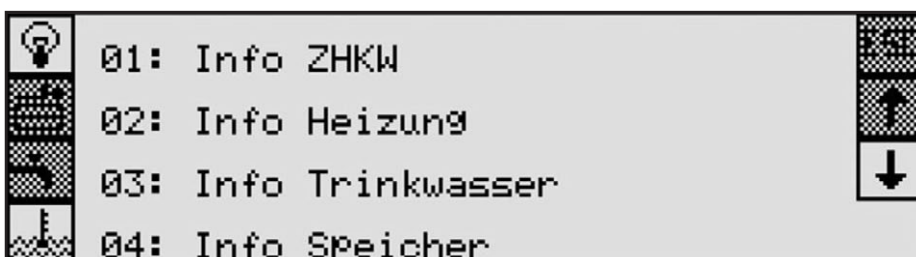


Fig. 23: Main menu/default screen of the CHP unit touch display



## 4.5 Scope of delivery

The scope of delivery of the Dachs Pro 20 ST overall system includes:

- CHP unit (VW EcoBlue 2.0 - Generation 1.2).
- Cladding set for the CHP unit (acoustic enclosure).
- MSR Pro 20 ST controller with mounting accessories.
- 2 × SE940 buffer vessels.
- Frequency converter (in control box) incl. electrical wiring to the CHP unit.
- **Basic installation set**  
sensor cable harness, clamps for equipotential bonding, heating water filter (TOTAL FILTER TF1, Fernox), buffer discharge pump with shut-off set and thermometer, connection set for gas and heating water, 2 × CO sensors, GSM antenna etc.
- Operator documentation folder with the overall technical documentation for the Dachs Pro 20 ST.



**Note:**

The overall system is delivered in multiple packaging units.



### 4.6 Accessories and options

The following components **must** be provided for the Dachs Pro 20 ST **on site**:

- Temperature-resistant and pressure-proof Raab GmbH exhaust system for the Dachs Pro 20 ST.
- Various line materials and components for the electrical installation (equipotential bonding connection, grid connection, connection lines for CO sensors, external sensors etc. as well as an electric sub-distribution).
- Gas connection at the installation location.
- Functional heating system at the installation location.

The following components may be purchased from SenerTec GmbH as accessories for the Dachs Pro 20 ST:

- Neutralisation unit.
- Analogue modem (option for the GSM modem for bad wireless connection).

#### Neutralisation unit:

For neutralisation (condensate cleaning) and proper discharge of condensate, we recommend using the optionally available neutralisation unit for the Dachs Pro 20 ST (article number: 4700-517-000).



#### Reference:

For a detailed product and functional description, please refer to the neutralisation box product documentation (art. no.: 4798.314.xxx).



Fig. 24: Neutralisation box

#### Communication/modem:

As an option for the GSM modem, an analogue modem is available for the Dachs Pro 20 ST during the system test phase (in case of bad reception in the wireless Vodafone network).



Fig. 25: Analogue modem for the MSR Pro 20 ST



## 5 Prior to installation

Prior to assembly and installation, the **constructional requirements** for a safe operation of the Dachs and all system components are to be ensured. This includes:

- Spatial requirements expected from the installation location.
- Access to the installation location.
- Requirements regarding the heating water.
- Supply air apertures required.
- Requirements regarding the exhaust gas installation.
- Connection requirements.



### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

### 5.1 Installation regulations

Assembly, commissioning, service, maintenance and repair may only be carried out by authorised and certified specialist staff. Product training carried out by SenerTec or by a training institution commissioned by SenerTec is a minimum requirement. All work on the electrical equipment may only be carried out by trained electricians.

Since the Dachs Pro 20 ST is operated with a public low-voltage grid, specific requirements for operation with public low-voltage grids apply. These include, for instance, the registration with and the approval of the distribution network operators as well as regulations regarding the parallel network operation.

For all installation work, in particular with respect to protective measures, the respective standards and regulations are to be complied with.

Reference is made to the series of DIN VDE 0100, particularly 0100-551, 0100-410 and 0100-430, VDE-AR-N 4105, TCR of distribution network operators and any special requirements:

- DIN VDE 0100-551 Low-voltage electrical installations - Low-voltage generating sets.
- DIN VDE 0100-410 Low-voltage electrical installations - Protection for safety - Protection against electric shock.
- DIN VDE 0100-430 Low-voltage electrical installations - Protection for safety - Protection against overcurrent.
- DIN VDE 0100-100 Low-voltage electrical installations - Fundamental principles, assessment of general characteristics, definitions.
- VDE-AR-N 4105 Generator units with low-voltage distribution networks - Technical minimum requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks.



**Attention:**

In Germany, the standard DIN 1988-100 as well as §19 WHG [German law on water management] are to be complied with.  
Outside of Germany, the respective country-specific regulations and laws are to be adhered to.

**Reference:**

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

## 5.2 Installation requirements

### 5.2.1 Installation height

The electrical output of the Dachs Pro 20 ST depends on the installation height as well as the air pressure at the location installation.

Tab.7: Electrical output depending on installation height and air pressure

Installation height	Air pressure (height)	Electrical output
0 m	1013 mbar	19.2 kW
100 m	1000.4 mbar	18.9 kW
500 m	951.6 mbar	18 kW
1000 m	893.8 mbar	16.9 kW
1500 m	839.6 mbar	15.9 kW
2000 m	788.7 mbar	14.9 kW
2500 m	740.8 mbar	14 kW

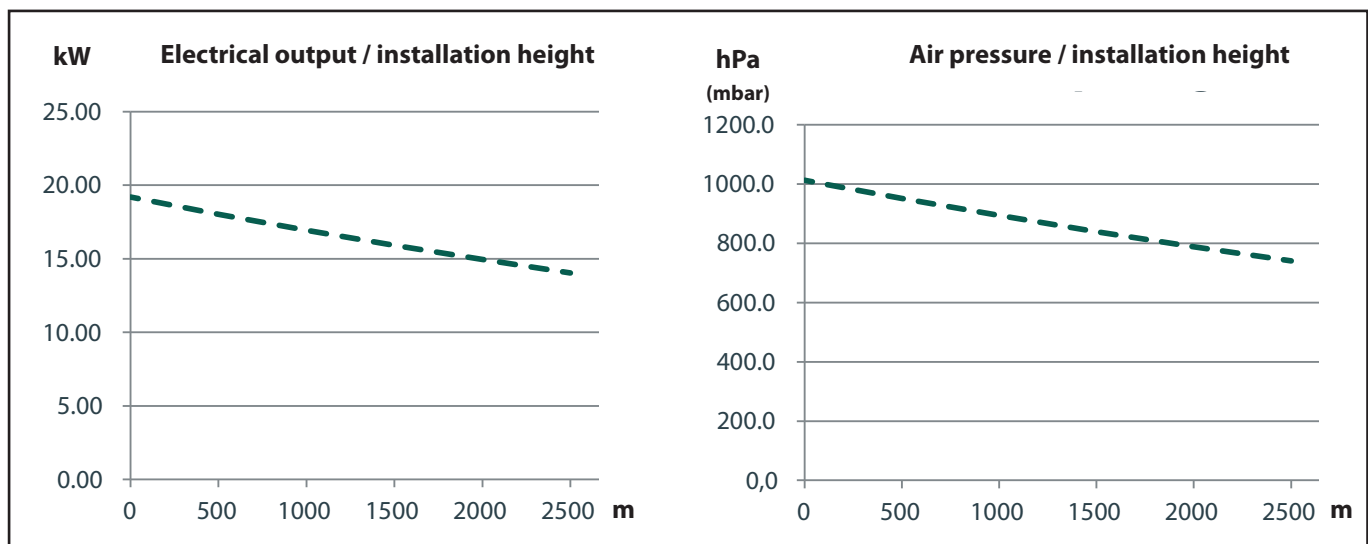


Fig. 26: Diagrams on installation at heights

**Reference:**

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.



## 5.2.2 Heating water requirements

According to VDI 2035, the admissible total hardness is determined both depending on the total heating output of the unit as well as on the specific system volume. If the Dachs Pro 20 ST is integrated into a heating system in combination with another heating boiler system, the stipulations of the VDI 2035 **must** be complied with and logged for the entire heating system.



### Reference:

For a detailed guide on the topic of heating water quality based on VDI 2035, please refer to the partner section on our website. Please refer to the *SenerTec information brochure on heating water treatment* (art. no.: 4798.399.xxx) before assembly and commissioning.



### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapter 6.7 Heating water treatment** in particular.



### Attention:

In case of incorrect treatment of heating water, the warranty for any resulting damage to the unit will become void.

Tab.8: Admissible water hardness according to VDI2035

Table according to VDI 2035.	Total heating output in kW	Specific system volume		
		< 20 l/kW	≥ 20 l/kW to < 50 l/kW	≥ 50 l/kW
	≤ 50	16.8 °dH (≤ 3.0 mol/m <sup>3</sup> )	11.2 °dH (≤ 2.0 mol/m <sup>3</sup> )	0.11 °dH (≤ 0.02 mol/m <sup>3</sup> )
	> 50 to ≤ 200	11.2 °dH (≤ 2.0 mol/m <sup>3</sup> )	8.4 °dH (≤ 1.5 mol/m <sup>3</sup> )	0.11 °dH (≤ 0.02 mol/m <sup>3</sup> )
	> 200 to ≤ 600	8.4 °dH (≤ 1.5 mol/m <sup>3</sup> )	0.11 °dH (≤ 0.11 mol/m <sup>3</sup> )	0.11 °dH (≤ 0.02 mol/m <sup>3</sup> )
	> 600	0.11 °dH (≤ 0.02 mol/m <sup>3</sup> )	0.11 °dH (≤ 0.11 mol/m <sup>3</sup> )	0.11 °dH (≤ 0.02 mol/m <sup>3</sup> )

Please note:

- Heating water may only be used for the purpose of heating in a closed circuit. Do not discharge any heating water in order to use it.
- Heating systems with underfloor heating must be equipped with a sludge trap (oxygen diffusion).
- Underfloor heating systems made of plastic tubing that is not oxygen tight according to DIN 4726 must be equipped with a heat exchanger as system separator.
- If required, the heating water (filling water of the buffer vessel) must be softened and desalinated.
- An operating pressure of **at least** 1 bar is required.



For operation, the following protective measures are recommended:

- The volume of recharging water is to be kept low by the installation of sectioning valves in case any repair needs to be carried out and to enable regular inspection of the expansion vessel.
- Addition of chemicals for stabilisation of hardness should be avoided since calcium carbonate may occur in the form of sludge.
- The safest methods for avoiding the formation of stones are softening and desalination in cation exchange, ion exchange or reverse osmosis.

### 5.2.3 Heating installation and return temperatures

#### Heating installation

- During installation, the Dachs Pro 20 ST assembly instructions and local requirements are to be observed.
- For integration on the heating water side, DIN 4751/T2 is to be observed (absolute temperature of the heating vessel < 100 °C).

#### Maximum and minimum return temperature:

- Admissible return temperatures in control operation are 30 °C to 70 °C. The temperatures must be under 30 °C during permanent operation.
- Temperatures below +10 °C are admissible.

#### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

### 5.2.4 Gas installation

#### Attention:

Gas installation is to be implemented in accordance with the technical regulations of the local gas suppliers and the TRGI/TRF and may only be carried out by specialist staff with respective authorisation for working with gas.

#### Note:

The gas pressure of the supply line is to be checked already in the planning phase. If the pressure in the gas line exceeds 54 mbar (LPG) or 24 mbar (natural gas), a pressure reducer has to be installed to reduce the gas pressure at rest to a maximum of 50 mbar (LPG) or 20 mbar (natural gas).

#### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapter 6.8 Gas supply** in particular.

#### Note:

The gas supply line provided on site must be equipped with a gas flow monitor (on site).

Regarding energy tax exemption, a gas meter or thermal energy meter **must** be installed on site.



### 5.2.5 Exhaust gas installation

For exhaust gas evacuation of the Dachs Pro 20 ST, a type-approved chimney and/or an exhaust gas duct **must** be used.

In cooperation with an exhaust pipe manufacturer, SenerTec has specified an appropriate pressure-tight and temperature-resistant exhaust gas system designed for the Dachs Pro 20 ST. Processing and delivery is managed directly by the manufacturer.

#### Regarding project planning and order processing, please contact:

Company: Raab GmbH  
Contact: Dirk Werner  
Address: Gladbacher Feld 5  
Post code, city: D - 56566 Neuwied  
Phone: +49 (0) 160 - 88 49 779  
E-mail: dirk.werner@raab-gruppe.de  
Internet: www.raab-gruppe.de

### 5.2.6 Supply air apertures



#### Attention! Danger:

Supply air apertures must not be obstructed.  
Closed supply air apertures may lead to incomplete combustion as well as to the formation of carbon monoxide. This may lead to poisoning.



#### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

### 5.2.7 Electric installation - Controller

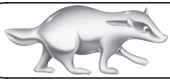
The electric installation is to be carried out according to the TCR of the distribution network operator (DNO) and applicable VDE standards, particularly VDE-AR-N 4105 *Generator units with low-voltage distribution networks - Technical minimum requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks*.

The Dachs Pro 20 ST featuring the Changetec BISI control and monitoring unit fulfils the requirements of VDE-AR-N 4105 for the operation at electrical distribution networks.



#### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.



## 5.3 Installation location requirements



### Note:

When planning the system, the space requirements of the components have to be taken into consideration. This applies to installation and assembly, but also to subsequent access to all components for maintenance and repair.

### 5.2.8 Dachs Pro 20 ST space requirements

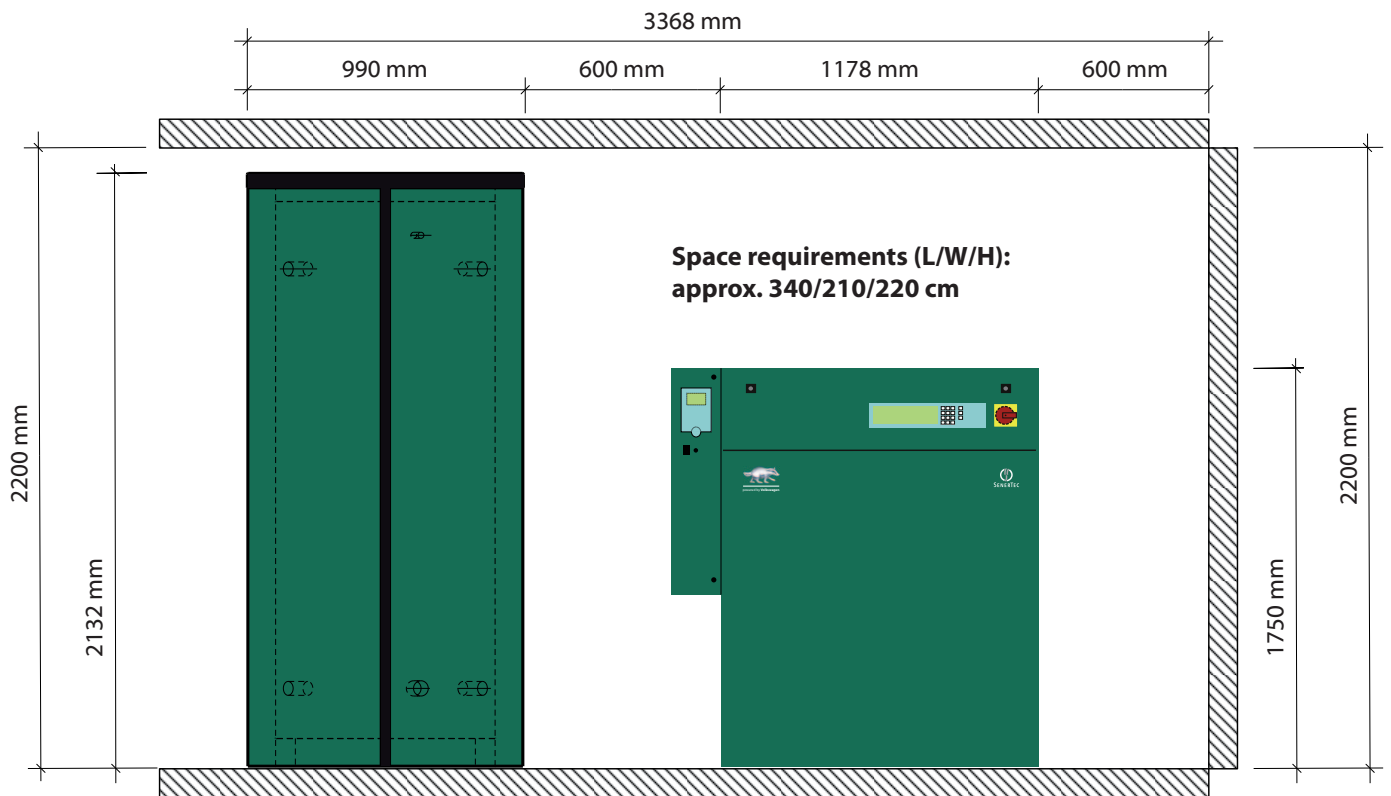


Fig. 27: Dachs Pro 20 ST space requirement (front view - 2 × SE940 buffer vessels one behind the other)

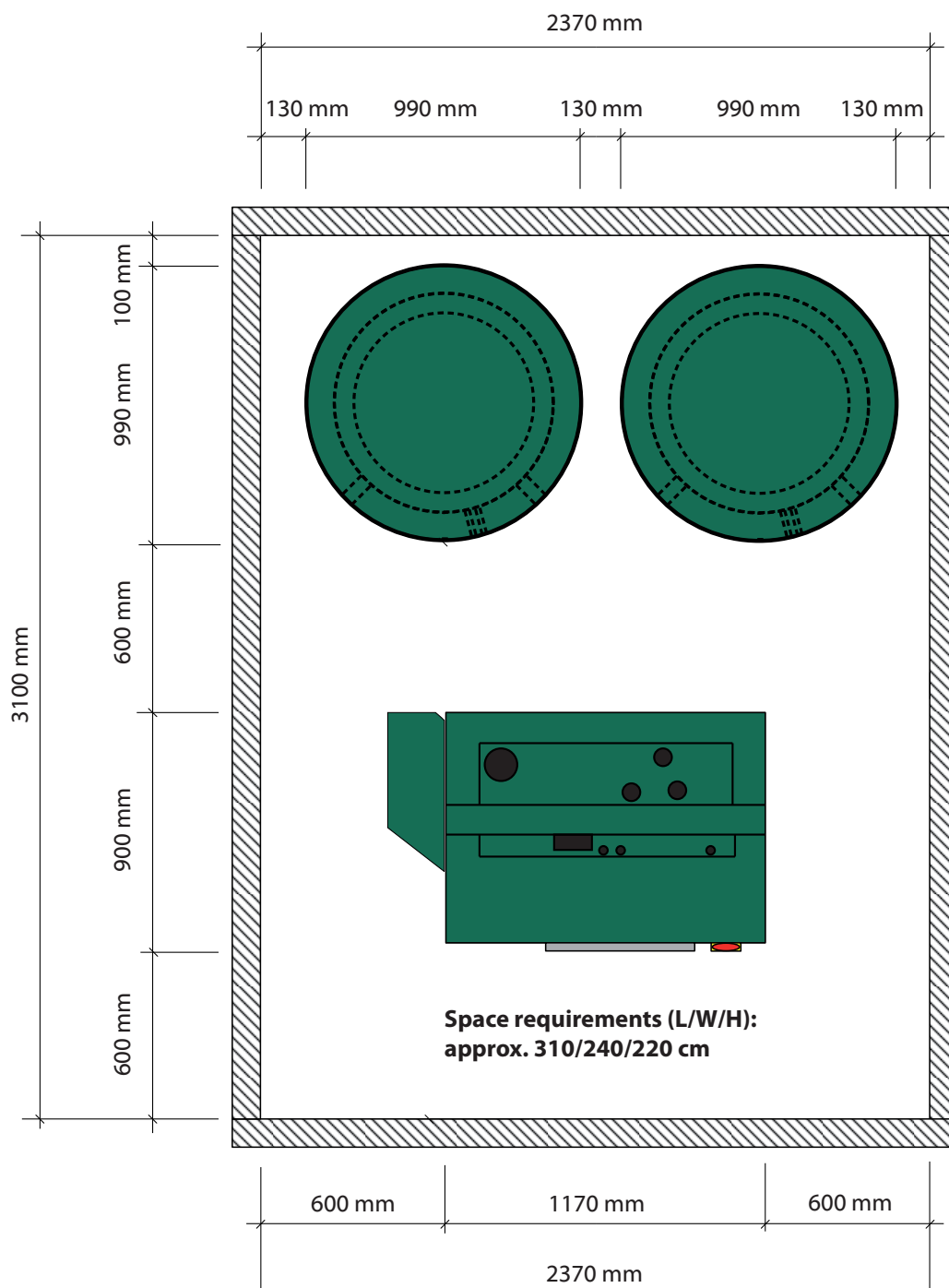


Fig. 28: Dachs Pro 20 ST space requirement (top view - 2 × SE940 buffer vessels one next to the other)



### 5.3.1 Installation requirements

- Heating room according to DVGW TRGI.
- Specific installation room.
- Room approved according to the ordinance for use of heating appliances or national regulations.

#### The room must fulfil the following specific criteria:

- Level foundation with a maximum incline of 1 % according to DIN EN 12828.
- Room only for fuel burning installations, heating pumps, combined heat and power stations and stationary combustion engines.
- No openings to other rooms except doors.
- Sufficient lighting.
- Room ventilation.
- Frost-protected.
- Socket recommended.
- Appropriately labelled emergency switch outside of the room.

The Dachs Pro 20 ST must not be operated in rooms where considerable air pollution by hydrogen halide is to be expected. For example:

- Hairdressers
- Printing houses
- Chemical cleaners
- Laboratories, etc.
- as well as in rooms with high dust content or a high level of humidity (e.g. laundry rooms).

### 5.3.2 Ambient conditions:

#### For storage:

Temperature: 5 - 60 °C

Humidity: up to 90 %

#### During operation:

Temperature: 5 - 35 °C

Humidity: up to 70 %

**Note:**

At temperatures below 10 °C, the temperature-related viscosity of the engine oil may lead to starting problems.



### 5.3.3 Installation requirements

#### Installation on floors/platforms

The statics of the floor must be suitable for the weight of the Dachs Pro 20 ST. Sufficient space for maintenance must be ensured.



**Attention:**

If required, suitable measures to ensure the required loading capacity of floors are to be coordinated with a structural engineer.

#### Required installation surface

For correct and safe assembly as well as for subsequent maintenance, the Dachs Pro 20 ST requires an installation surface of approx. **7.5 m<sup>2</sup>**.

Space requirements (L/W/H): **approx. 340/210/220 cm** - 2 × SE94 buffer vessels on the broad side behind the CHP unit

Space requirements (L/W/H): **approx. 310/240/220 cm** - 2 × SE94 buffer vessels on the length side behind the CHP unit

#### Required fresh air supply

A fresh air flow for the combustion process in the CHP unit of **at least 80 kg/h** is required.



**Note:**

According to DVGW G600, the size of the ventilation apertures to the installation room of the Dachs Pro 20 ST has to be at least **170 cm<sup>2</sup>**.



**Attention! Danger:**

Never close existing supply air apertures.  
Closed supply air apertures may lead to incomplete combustion as well as to the formation of carbon monoxide. This may lead to poisoning.



**Reference:**

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.





### 5.4 Transport

If possible, all unit components should be transported to the installation location while still in their packaging. Use suitable transportation aids for heavy loads.

**Attention:**

Check the packaging for transportation damage.

**Reference:**

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

#### 5.4.1 Access to the installation location

During project planning, it has to be ensured that the access to the installation location is guaranteed for all components of the unit.

Please also note the following general framework conditions:

- The components have high lifting loads.
- For the CHP unit of the Dachs Pro 20 ST, access openings with a width of at least 90 cm are required at the installation location.

**Note:**

Please also note the swivel dimensions for access to the installation location.

- The SE940 buffer vessel is pre-assembled before delivery.
- Lifting devices are to be provided for transportation.

**Note:**

Lifting devices increase the space required during transportation.

#### 5.4.2 CHP unit transport

**Reference:**

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapter 4 Transport** in particular. The option of dismantled transport is also described there.

Information on the following points is to be obtained in advance:

- Dimensions and weights.
- Required transportation aids.
- Required special tools.
- Scope of delivery and packaging units.
- Required safety measures.



### 5.4.3 SE940 buffer vessel transport to the installation location

- The SE940 buffer vessel is only to be transported in its transport packaging.
- Do not remove the transportation packaging before having reached the installation location.
- Ensure that the buffer vessels are secured at the means of transportation at all times during transportation.

One buffer vessel weighs approx. 170 kg (without insulation). When transporting the buffer vessel to the installation location, suitable lifting aids are required. When planning the transportation to the installation location, the external dimensions are to be taken into consideration.

## 5.5 Unpacking and preparations

- Inspect the packaging units for transport damage and check the scope of delivery with the packaging list provided.
- Unpack the assemblies/parts of the packaging units and position them at the installation location.
- Remove the fixtures of the SE940 buffer vessels at the transport pallet.
- Dispose of the packaging material in an environmentally friendly manner according to the applicable law on recycling and waste management (KrW-/AbfG in Germany).



#### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

### CHP unit alignment and positioning



#### Note:

For positioning of the CHP unit at the installation location, the provided template is to be used to ensure compliance with all clearance requirements including cladding requirements.



## 5.6 Connection diagram

### Hydraulic connection diagram - Dachs Pro 20 ST

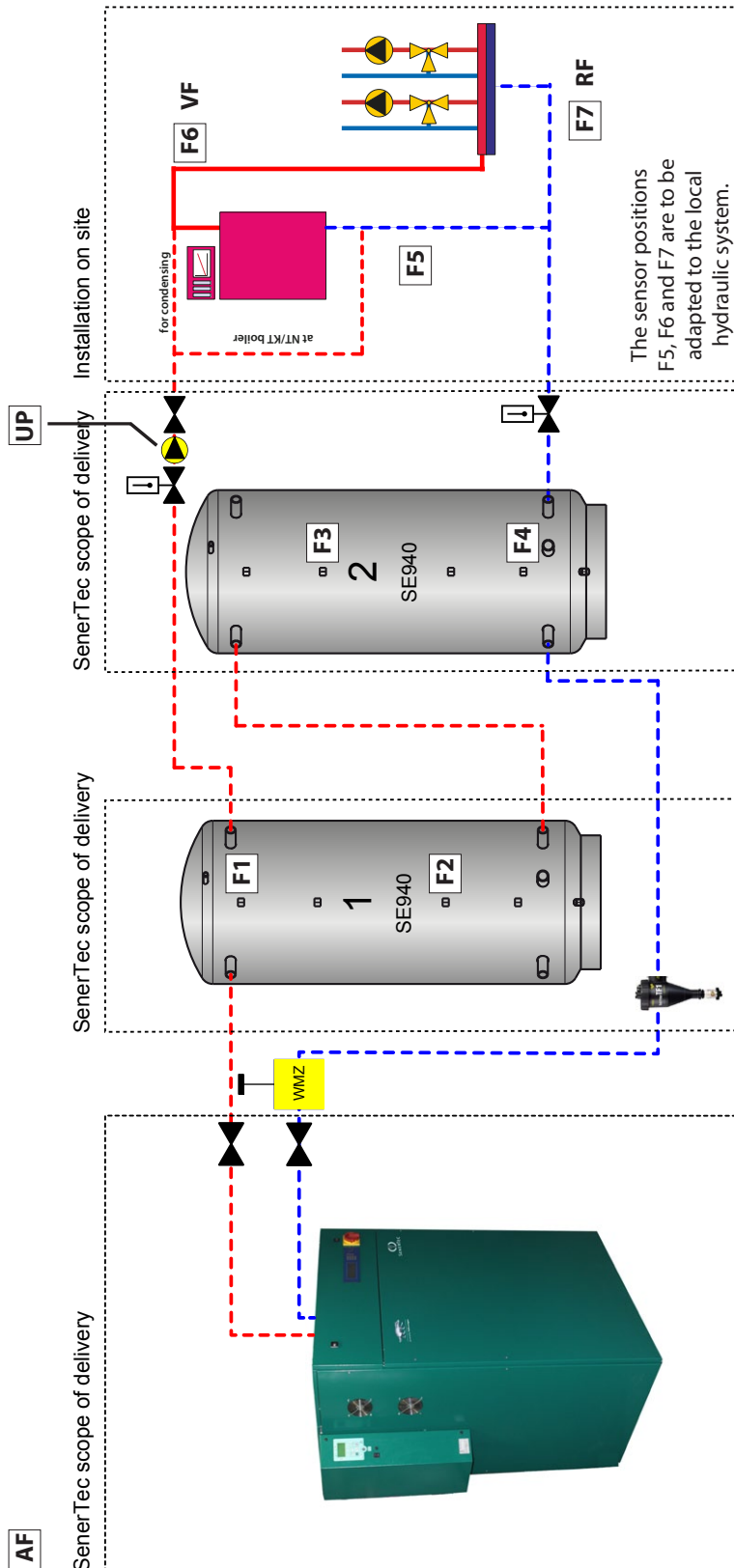


Fig. 29: Hydraulic connection diagram - Dachs Pro 20 ST

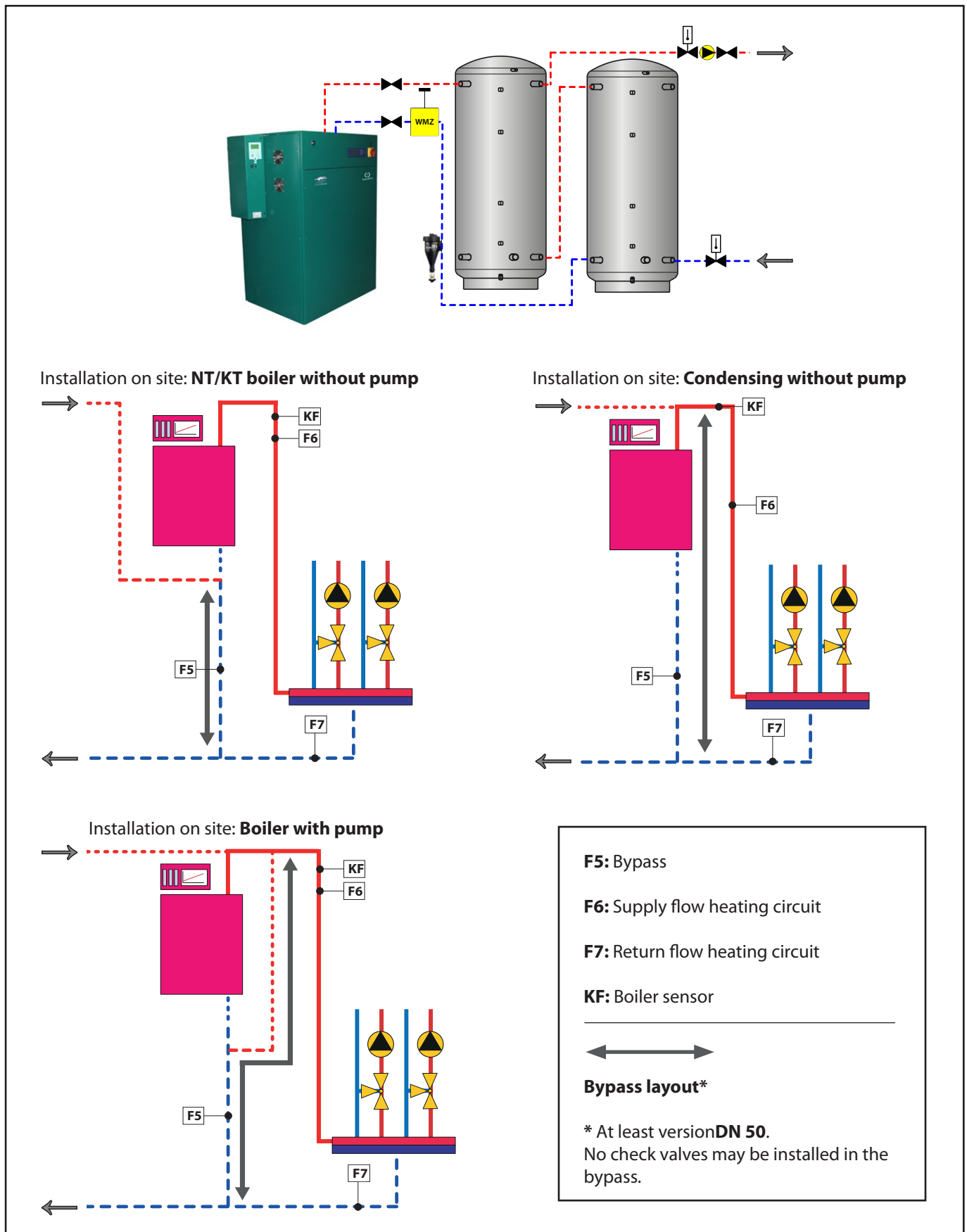
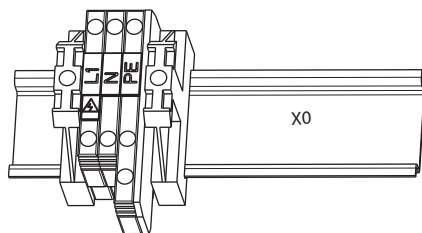


Fig. 30: Variants of hydraulic integration according to the installation on site



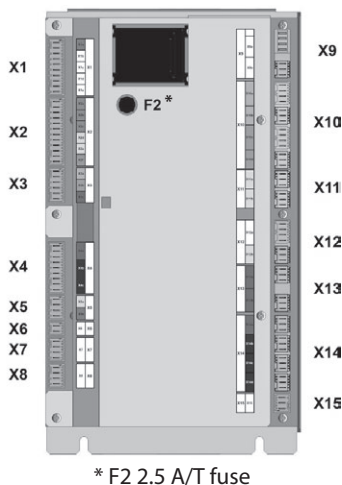
## Electrical connection diagram - MSR Pro 20 ST



Connection bar	Terminal	Use	Note
X0	1	L1	MSR Pro 20 ST mains connection
	2	N	
	3	PE	

Connection bar	Plug designation	Use
X1	X1a	External sensor (AF)
	X1b	Buffer vessel sensor 1 (F1)
	X1c	Buffer vessel sensor 2 (F2)
	X1d	Buffer vessel sensor 3 (F3)
	X1e	Buffer vessel sensor 4 (F4)
X2	X2a	F5
	X2b	F6
	X2c	F7
	X2d	-
	X2e	Prog. input
	X2f	Prog. input
X3	X3a	-
	X3b	-
	X3c	-
X4	X4a	-
	X4b	Pulse input 1
	X4c	Pulse input 2
X5	X5a	PWM signal
	X5b	-
X6	X6	-
X7	X7	CAN bus controller PCB
X8	X8	-

### MSR Pro 20 ST power board



#### Details:

#### X5a connector

PWM signal buffer discharge pump

Ground (blue) → **G**

PWM output (brown) → **P1**

PWM input (black) not required



Connection bar	Plug designation	Use
X9	-	-
	X9a	MSR Pro 20 ST mains supply 230 V~/50 Hz (6.3 A/T prefuse)
	X9b	-
X10	X10a	-
	X10b	-
	X10c	-
	X10d	-
X11	X11a	prog. output 230 V~/50 Hz (max. 250 VA)
	X11b	prog. output 230 V~/50 Hz (max. 250 VA)
X12	X12a	-
	X12b	-
X13	X13a	-
	X13b	-
X14	X14a	-
	X14b	Discharge pump control (max. 250 VA)
	X14c	-
	X14d	-
X15	X15	-

Fig. 31: Electrical connection diagram - MSR Pro 20 ST

## Electrical connection diagram - CHP unit

#### Reference:

Please observe the electrical connection diagram and the circuit diagram in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2).

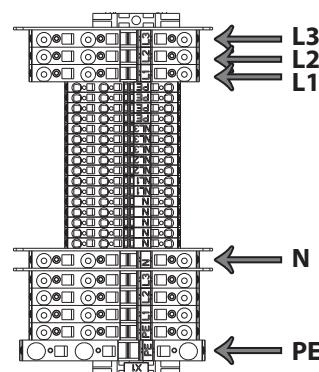


Fig. 32: X1 grid connection of the CHP unit



## 6 Installation

### 6.1 General information

Installation of the Dachs Pro 20 ST may only be carried out by authorised and certified specialist staff. Product training carried out by SenerTec or by a training institution commissioned by SenerTec is a minimum requirement. All work on the electrical equipment may only be carried out by trained electricians.

#### Reference:



For CHP installation, particularly the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) are to be observed.

### 6.2 Assembly

#### Note:

Prior to installation of the Dachs Pro 20 ST, the information in the previous chapters on the following topics is to be observed:



- **Installation location requirements (chapter 5.3).**
- **Transport (chapter 5.4).**
- **Unpacking and preparations (chapter 5.5).**

#### 6.2.1 CHP installation

#### Reference:



For CHP installation, please observe the instructions in the iav documentation of VW on EcoBlue 2.0 (Generation 1.2) - **Chapter 6 Installation/assembly** in the *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.

#### 6.2.2 Partial assembly of the CHP cladding

Before assembly of the mounting for the MSR Pro 20 ST controller and the controller unit at the CHP, **at least** the following components need to be assembled at the CHP:

- Frame for cladding components ① (fully assembled).
- Left cladding ② (fully assembled).
- Top, rear cladding ③ (**only set on loosely!**).

#### Reference:



For assembly of cladding components, please observe the instructions in the iav documentation of VW on EcoBlue 2.0 (Generation 1.2) - **Chapter 6.2 Basic module installation** in the *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.

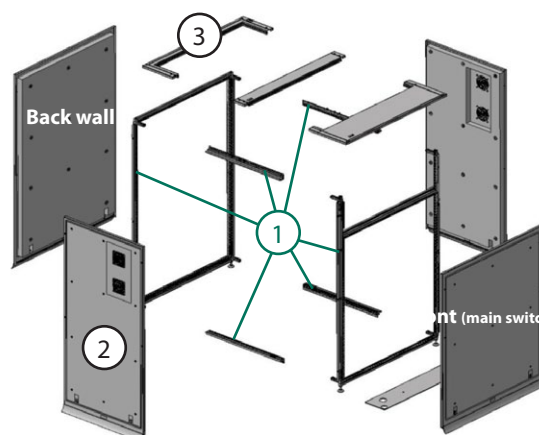


Fig. 33: CHP cladding / frame components



## 6.2.3 Assembly of the MSR Pro 20 ST at the CHP

### Mounting installation at the CHP

- ▶ Lift the top rear cladding ③ as illustrated and position the washer ④ on the frame component.
- ▶ Lower the top rear cladding ③ and align the cladding to the washer and the frame component according to the drilled hole.
- ▶ Position the hinge pin ⑤ over the drilled hole of the top rear cladding ③.
- ▶ Secure the hinge pin ⑤ with the M12×80 cylinder screw ⑥ at the frame component.  
Torque: **20 Nm**

### Mounting installation at the MSR Pro 20 ST

To attach the MSR Pro 20 ST at the CHP, some preparatory mounting steps have to be performed. The required components are provided as accessories.

- ▶ Attach the mounting bracket ⑧ as illustrated with the distance plate ⑦ using the 3 M8×20 RIPP screws and 3 M8 RIPP nuts at the controller housing.
- ▶ Attach the hinge plate ⑨ as illustrated using the 4 M6×20 RIPP screws at the mounting bracket ⑧.

#### Attention:

The RIPP screw connections of the MSR Pro 20 ST mounting must be applied **very tightly** to ensure equipotential bonding for the controller.

**Background: painted components!**

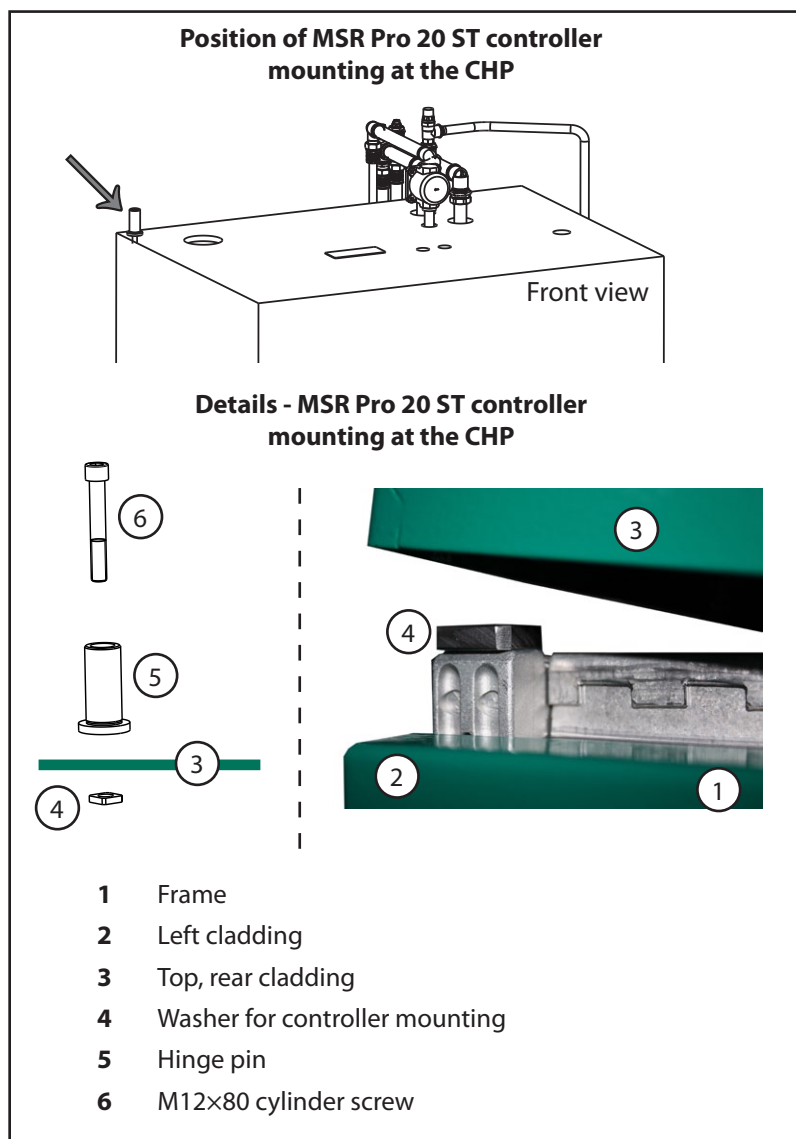


Fig. 34: Mounting position of the MSR Pro 20 ST at the CHP

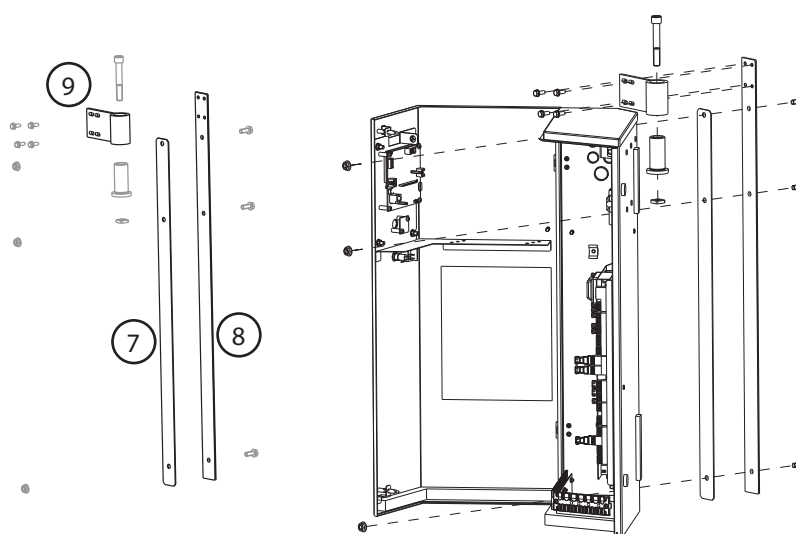


Fig. 35: Mounting at the MSR Pro 20 ST



## Suspension of the MSR Pro 20 ST at the CHP

- Suspend the pre-assembled MSR Pro 20 ST as illustrated from above at the hinge pin ⑤.

No additional attachments or fixtures for the MSR Pro 20 ST at the CHP are required.

### Note:

The hinged design of the controller mounting allows the MSR Pro 20 ST to be swivelled to the side or back **at any time** for installation or mounting and to remove the left cladding.



On swivelling back, the MSR Pro 20 ST automatically attaches to the left cladding of the CHP using magnets at the controller housing.

### Note:

Using the slotted holes (4) for screw connection at the hinge plate of the controller mounting, the MSR Pro 20 ST can be precisely aligned.

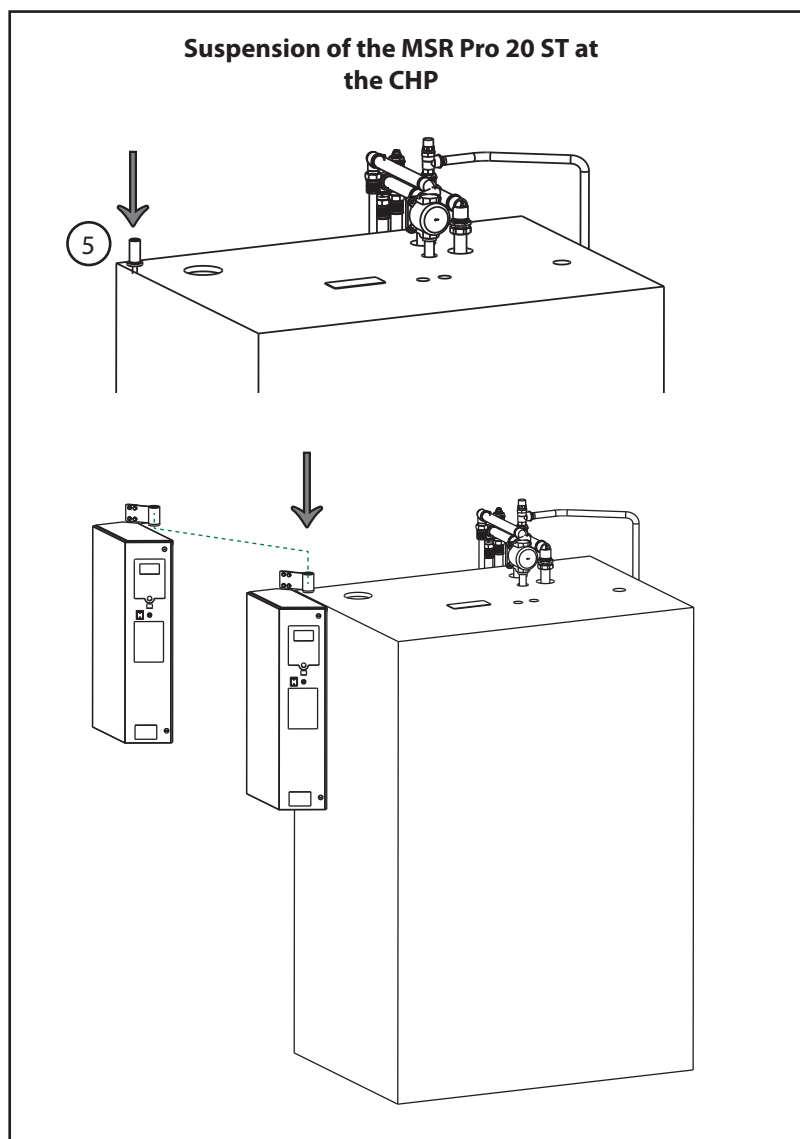
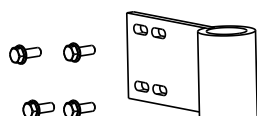


Fig. 36: Suspension of the MSR Pro 20 ST at the CHP

## 6.2.4 SE940 buffer vessel installation

The Dachs Pro 20 ST design enables CHP-independent positioning of the buffer vessels on the left side, right side or behind the CHP. However, the specified installation conditions and clearances have to be complied with.

### Note:

The transfer lines included in the scope of delivery of the CHP (heating water hoses with ball valves) cannot be connected directly to the buffer vessel. The connection lines between the transfer at the respective ball valve of the heating water hose to the buffer vessel are to be provided and dimensioned on site.



The SE940 buffer vessels can be positioned on floors without special foundations. However, the floor has to provide sufficient load capacity. On uneven floors, appropriate underlays are to be applied to ensure safe support of the buffer vessels. A frost-protected room is to be selected for installation if no frost protection agent is to be used in the heating system. Otherwise, the buffer vessel has to be discharged if there is a risk of frost.



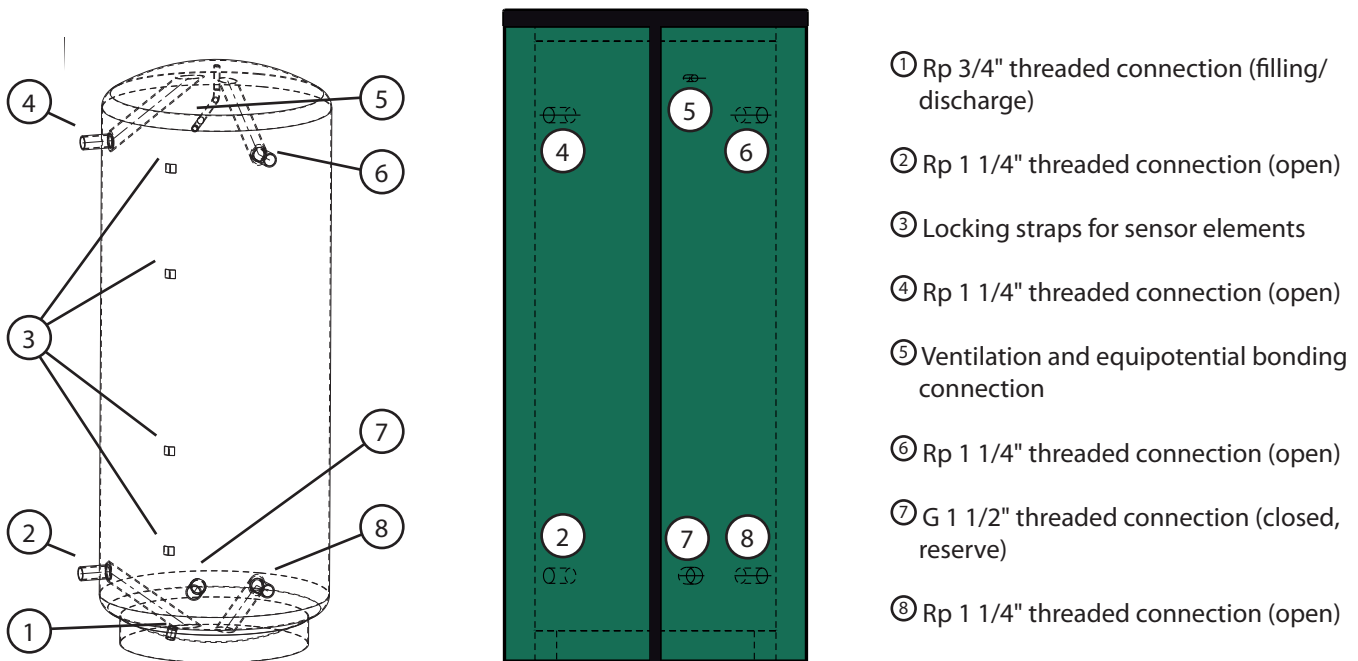


Fig. 37: Connections at the SE940 buffer vessel (without insulation on the left, with insulation visible connections on the right)

**Note:**

The SE940 buffer vessel is delivered with assembled buffer insulation. It has to be removed after transport to the installation location.

## Installation and assembly at the SE940 buffer vessel

- ▶ Both SE940 buffer vessels are to be installed under consideration of the installation surface and clearances.
- ▶ Both buffer vessels have to be properly aligned.
- ▶ The provided sensors F1, F2, F3 and F4 are to be assembled at the sensor lugs of the buffer vessels according to the hydraulic diagram (for positioning, refer to the figures).

**Attention:**

Ensure that the sensors are firmly attached to the buffer vessel.

- ▶ Assemble one of the provided earthing clamps ⑨ at the air vent ⑤ of **each** buffer vessel for later connection of the equipotential bonding line.  
The installation position at the air vent is not coloured.  
**Equipotential bonding connection diameter: 1x6 mm<sup>2</sup>**
- ▶ Assemble one of the provided reducer brackets ⑩ and one automatic vent ⑪ at the air vent ⑤ of each buffer vessel and seal it.



Fig. 38: Figure of 2 x SE940 buffer vessels

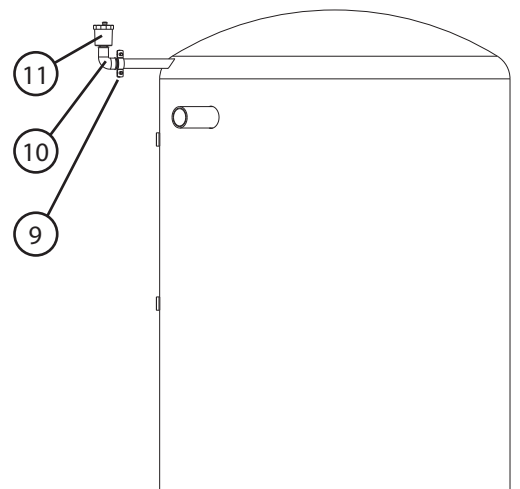


Fig. 39: Connections at the SE940 air vent



- Assemble one 45° bracket <sup>12</sup>, one reducer <sup>13</sup> and one KFE valve <sup>14</sup> from the provided installation accessories at the bottom connection <sup>1</sup> of each buffer vessel and seal it. **This connection serves for filling and discharge.**

### Insulation assembly at the SE940 buffer vessel

#### Attention:

To prevent cracking at the outer cover, at least room temperature ( $> 15\text{ }^{\circ}\text{C}$ ) is required during assembly. Carefully attach the buffer insulation during assembly. The insulation elements are supplied **ready for installation**. **Do not carry out any changes** to the elements. In particular, do not cut any insulation elements.



The insulation of each SE940 includes the following individual elements:

- 1 × bottom insulation <sup>A</sup>
  - 1 × cladding insulation <sup>B</sup>
  - 1 × cover insulation <sup>C</sup>
  - 1 × cover <sup>D</sup>
- Position a bottom insulation (ring) around **each** SE940 buffer vessel.
  - Carefully position a cladding insulation around **each** SE940 buffer vessel. The alignment is defined by the connections of the buffer vessels and the respectively provided slots in the cladding insulation.
  - Connect both ends of the sheath insulation and close a part of zip fastening to secure the cladding insulation.
  - Connect one of the provided sensor cable harnesses to **each** buffer vessel and route the end of the cable harness upwards out of the cladding insulation of the buffer vessel.

#### Note:

Sensor lines do not conduct mains voltage and must not be installed in parallel to the live lines (separate installation). Otherwise, screened lines have to be installed (e.g. type LiYY or LiYCY). The residual length of cable harnesses have to be deposited separately and above the insulation on top of the buffer vessel.

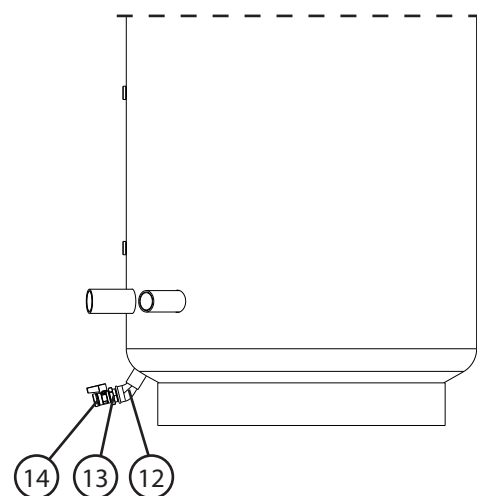


Fig. 40: SE940 filling and discharge connection

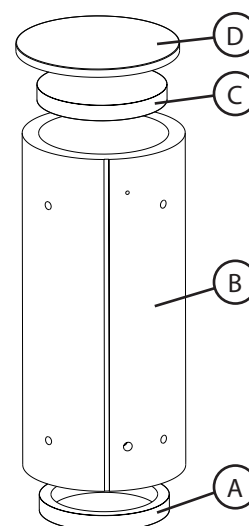


Fig. 41: SE940 insulation components

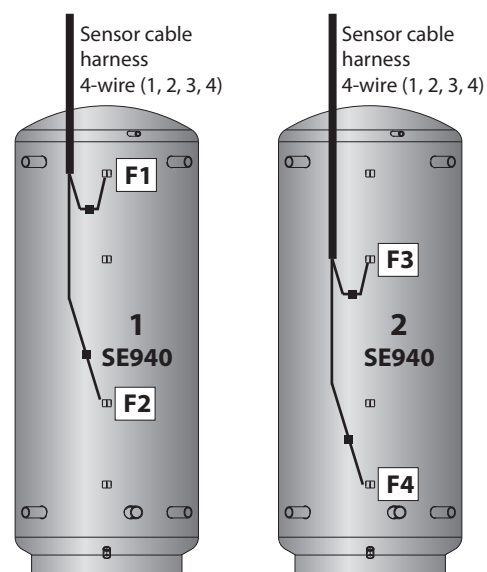


Fig. 42: Sensor cable harness assembly



- Firstly, close the complete zip fastening of the cladding insulation at each buffer vessel.
- Position the cover insulation on each SE940 buffer vessel.
- Route the end of the respective sensor cable harness at each buffer vessel to the back above the cover insulation and out of the cladding insulation.
- Position the cover on top of the cover insulation or around the cladding insulation at each buffer vessel.

### 6.2.5 Frequency converter control box assembly

Assemble the provided frequency converter according to the manufacturer instructions on a wall near the Dachs Pro 20 ST overall system.



#### Attention:

Observe that the provided cable set has a length of **10 m** and **must not/cannot** be extended.



#### Reference:

For frequency converter connection, please observe the instructions in the iav documentation of VW on EcoBlue 2.0 (Generation 1.2) - *Frequency converter connection at Dachs Pro 20 ST*, art. no. 4798.536.xxx.



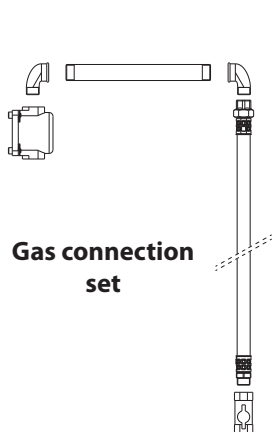
Fig. 43: Frequency converter assembly

### 6.3 Preparations

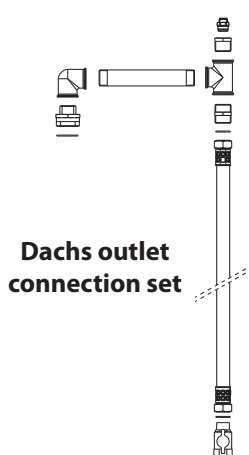
#### Note:

For hydraulic (heating water side) connection of the CHP, some pre-assemblies are required.

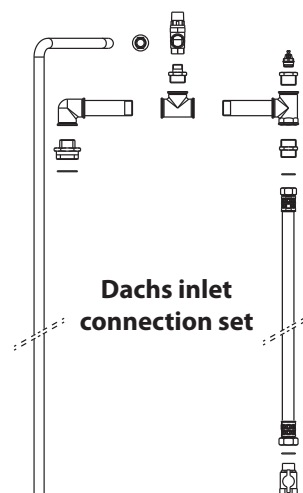
Take the separately packed components for the respective connection out of the accessory/installation set of the Dachs Pro 20 ST and have them ready for assembly.



Gas connection set



Dachs outlet connection set



Dachs inlet connection set



## 6.4 Hydraulic connection

AF

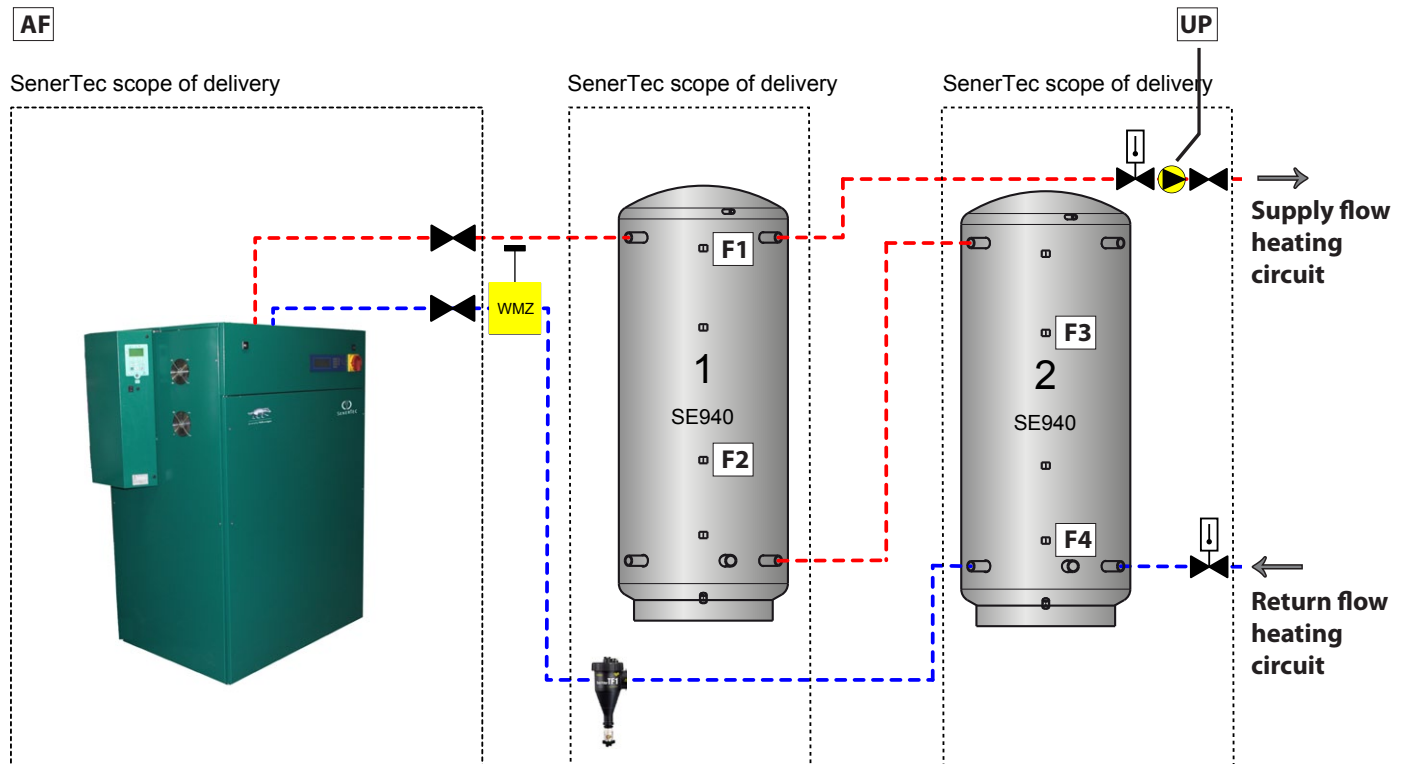


Fig. 44: Hydraulic connection diagram - Dachs Pro 20 ST

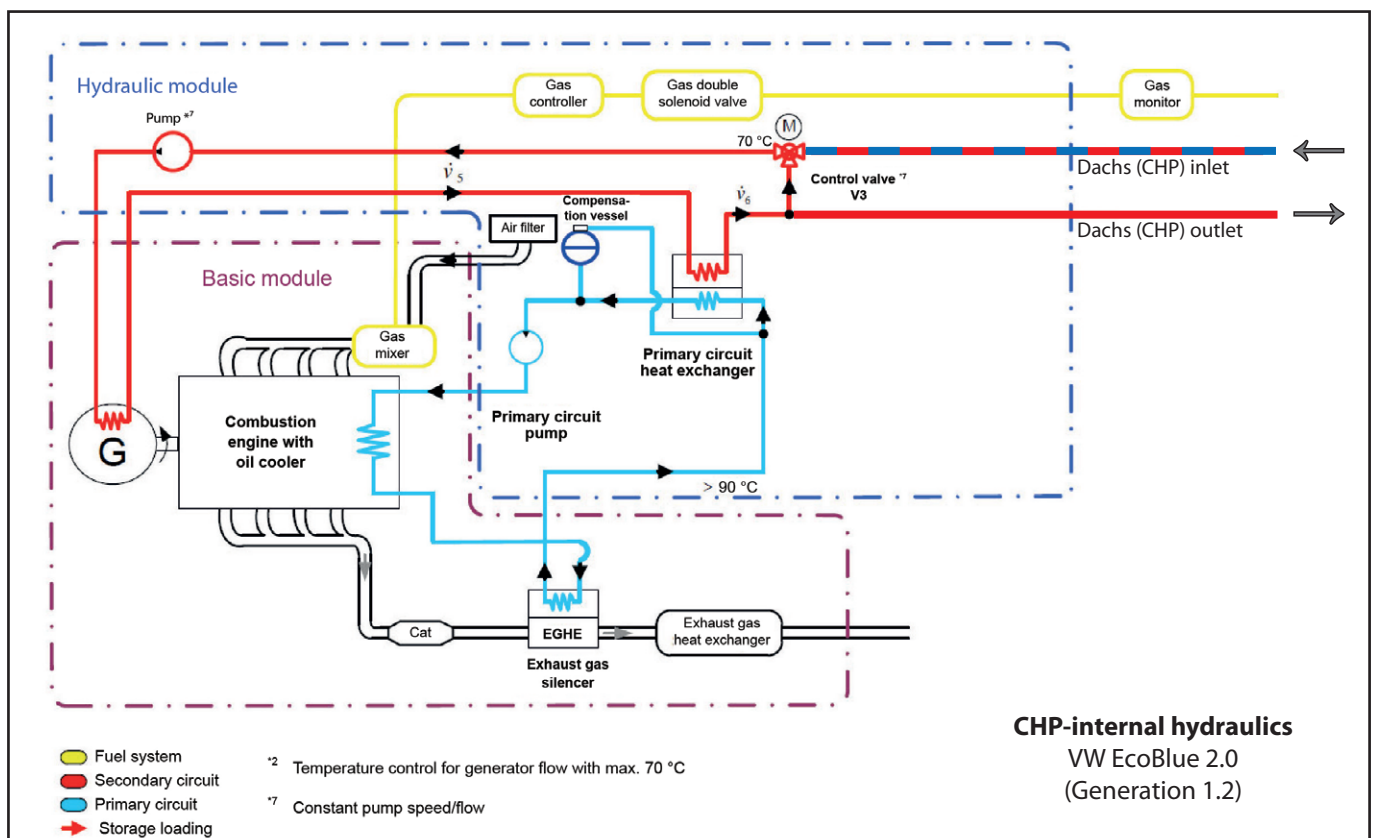


Fig. 45: Hydraulic connection diagram - CHP-internal

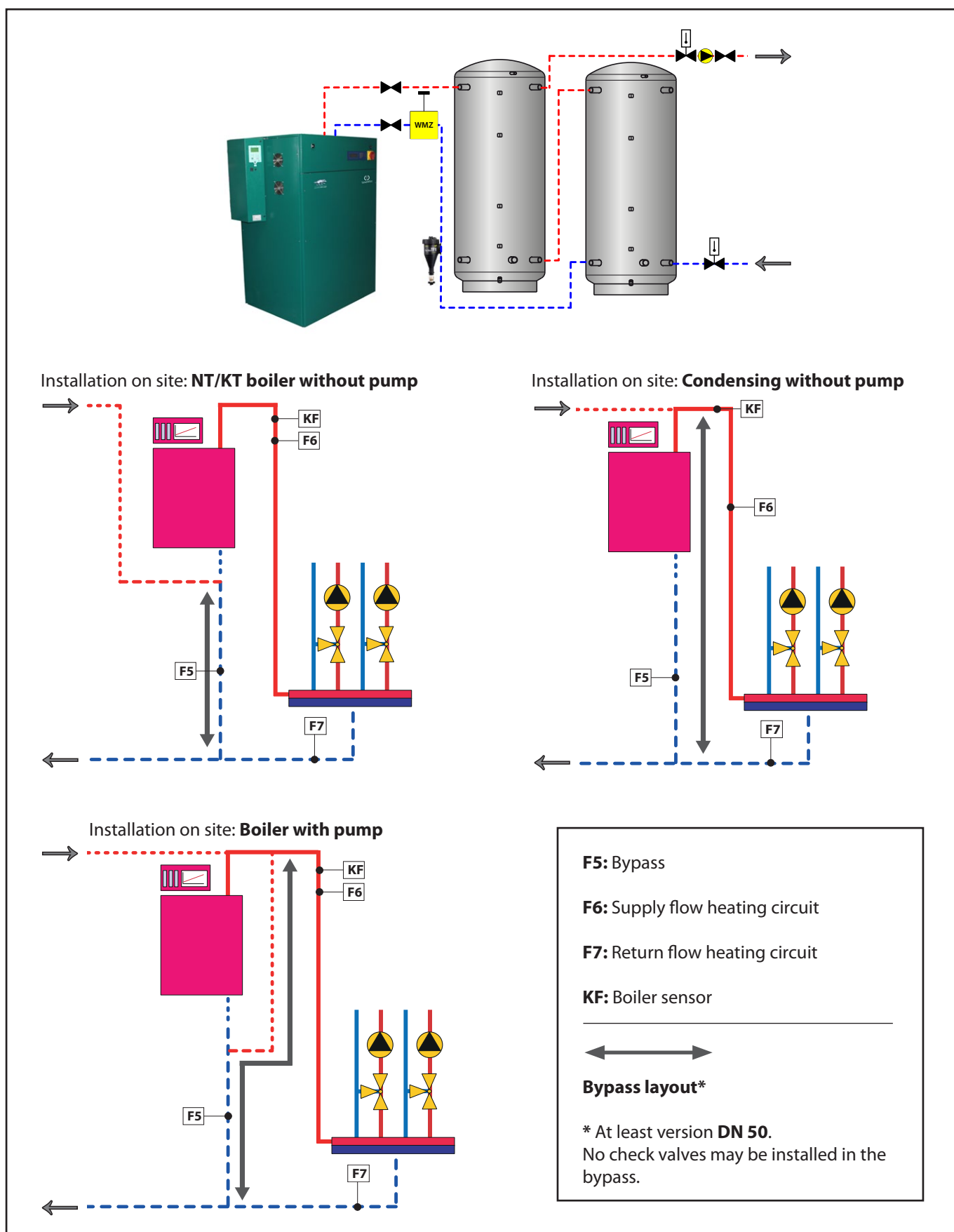


Fig. 46: Variants of hydraulic integration according to the installation on site



### Description of hydraulic integration:

The heat transfer to the heating circuit is performed via a controlled pump. This buffer discharge system is controlled by the MSR Pro 20 ST. For the detailed connection/transfer points of the flow and return lines in the heating circuit, please refer to the hydraulic schematic diagrams.

**The length of the connection of the on site flow and return lines (SE940 buffer vessel transfer) is 1 1/4".**

The dimensioning of the on site flow and return lines from the buffer vessel to the heating circuit depend on the distance. In most cases, 1" of tubing is sufficient. For longer distances, please consult the SenerTec planning hotline on dimensioning.

All required temperature sensors (sensors **F1-F7** including the external sensor **AF**) are included in the scope of delivery.

- **Sensors F1 - F4 (assembly at the sensor lugs of the SE940 buffer vessels).**
- **Sensors F5, F6 and F7 (assembly using the provided tension strap according to the positioning on the schematic diagrams).**



#### Information on hydraulics in the system test phase:

For system testing, only one controller for filling and discharge of the buffer vessels will be available. Control of a second heat generator or distribution as well as multi-module functionality is **not** intended. During system tests, the Dachs Pro 20 ST is always operated with 2 SE940 buffer vessels.

The control system is only designed for hydraulic integration.

### Dachs Pro 20 ST scope of delivery for hydraulic integration:

- Dachs inlet connection set (screw connection to CHP, fittings, manual vents, heating water hose and ball valve).
- Dachs outlet connection set (screw connection to CHP, fittings, 3 bar safety valve, manual vents, heating water hose and ball valve).
- Magnet filter (TF1 total filter, Fernox)
- Pressure gauge.
- Buffer discharge pump with shut-off set and red thermometer (to be installed in the flow from the buffer vessel to the heating circuit).
- Shut-off set with blue thermometer (to be installed in the return from the heating circuit to the buffer vessel).
- Automatic vents for buffer vessels.
- Filling and discharge set for the SE940 buffer vessels.



#### Attention:

All hydraulic (heating water side) lines are to be insulated **on site**.

- **Risk of burning** (potentially high temperatures).
- **Heat losses** (in case of non-insulated lines on the surface).



## Dachs outlet connection set assembly:



### Note:

Positions ② to ⑧ can be pre-assembled.

### Step 1

- Tighten and pre-assemble components ② to ⑧.

### Step 2

- Connect the pre-assembled assembly including flat packing ① to the CHP (Dachs outlet).  
Alignment to the rear

### Step 3

- Connect the ball valve ⑫ to the transfer point to the buffer vessel prepared on site.

### Step 4

- Tighten the heating water hose ⑩ with flat packings ⑨ on both sides **stress-relieved** between the ball valve ⑫ and the threaded fitting ⑧.

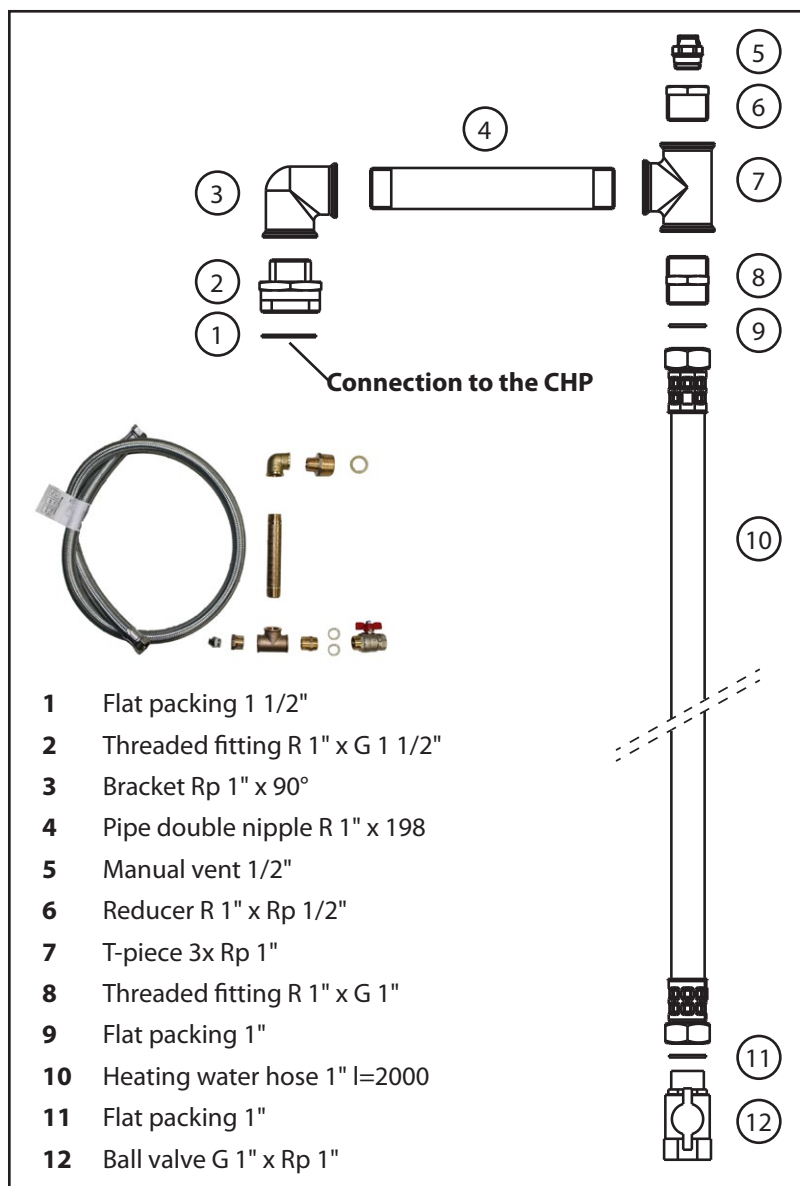


Fig. 47: Dachs outlet connection set

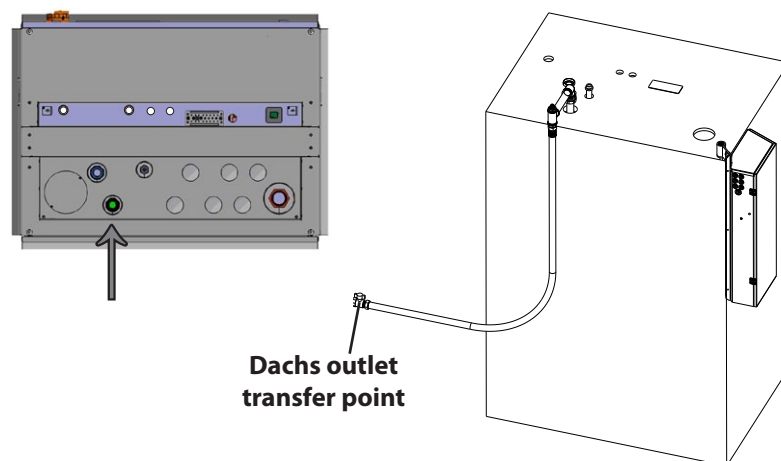


Fig. 48: Dachs Pro 20 ST rear view - Dachs outlet connection



### Dachs inlet connection set assembly:



#### Note:

Positions ② to ⑫ can be pre-assembled.

#### Step 1

- Tighten and pre-assemble components ② to ⑫.

#### Step 2

- Connect the pre-assembled assembly including flat packing ① to the CHP (Dachs inlet). Alignment to the rear

#### Step 3

- Connect the ball valve ⑯ to the transfer point to the buffer vessel prepared on site.

#### Step 4

- Tighten the heating water hose ⑭ with flat packings ⑬ on both sides **stress-relieved** between the ball valve ⑯ and the threaded fitting ⑬.

### Safety valve discharge:

In case of overpressure, water escapes through the discharge of the safety valve. Ensure that the escaping water is discharged safely.



#### Attention:

Do not connect the discharge of the safety valve rigidly to a discharge line at a wall as this leads to noise transmission.

#### Step 5

- Connect positions ⑰ and ⑱ to the safety valve ⑦.

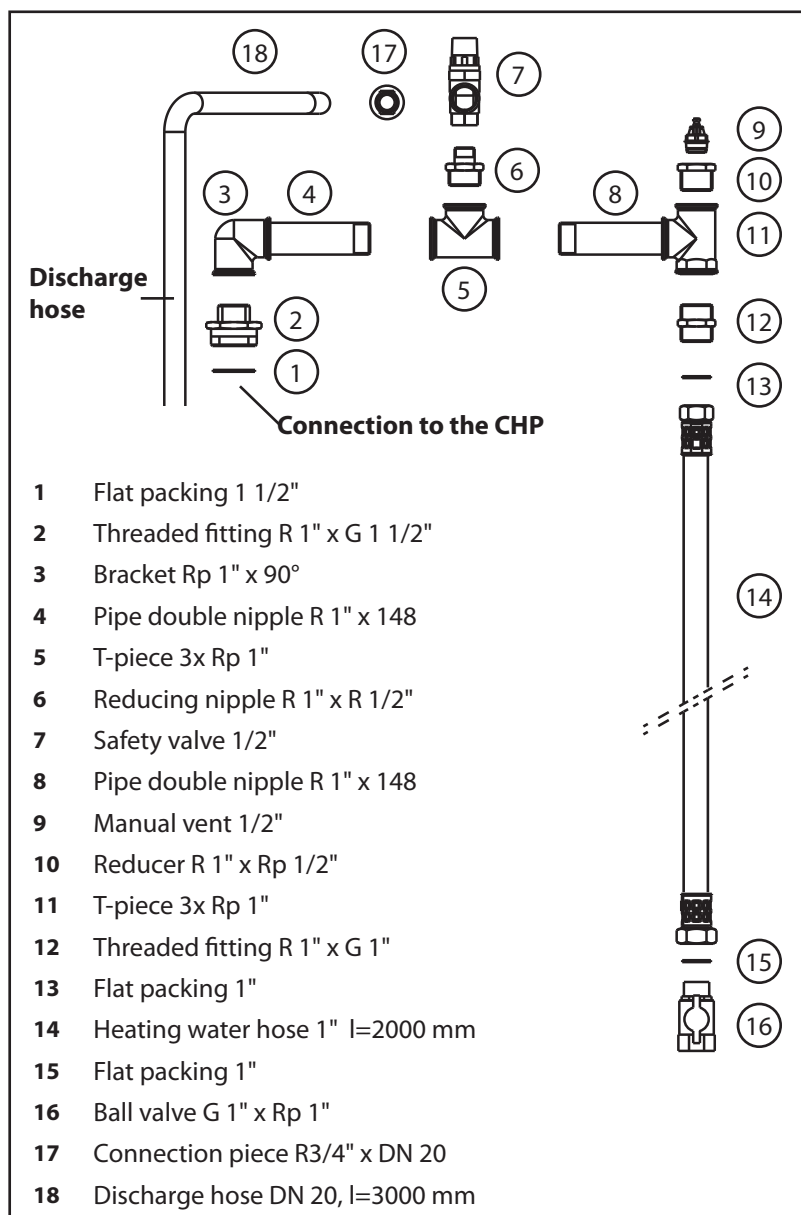


Fig. 49: Dachs inlet connection set



Fig. 50: Dachs inlet components



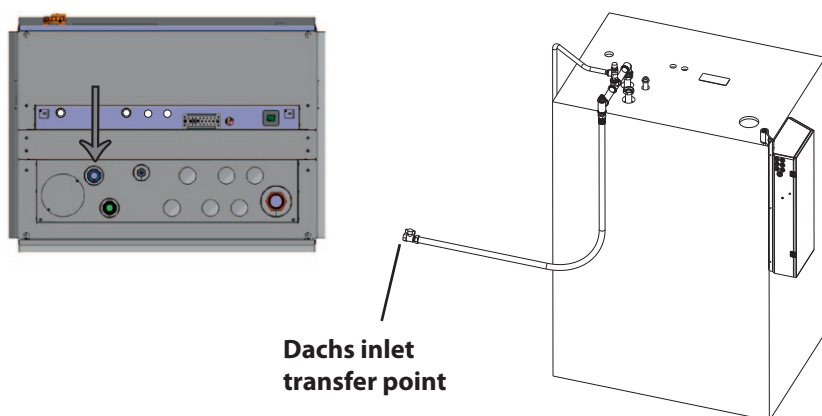


Fig. 53: Dachs Pro 20 ST rear view - Dachs outlet connection

## Buffer discharge pump and shut-off set assembly:

- ▶ Install the provided buffer discharge pump including shut-off set with thermometer (red) and shut-off valve with check valve in the **flow to the heating circuit** according to the manufacturer instructions.  
**Positioning - see hydraulic schematic diagram.**



### Attention:

For installation, the alignment of the buffer discharge pump and the shut-off valve including check valve has to be observed - **observe the flow direction arrows.**

- ▶ Install the provided shut-off unit with thermometer (blue) in the **return from the heating circuit** according to the manufacturer instructions.  
**Positioning - see hydraulic schematic diagram.**



Fig. 51: Components - Buffer discharge pump with shut-off set

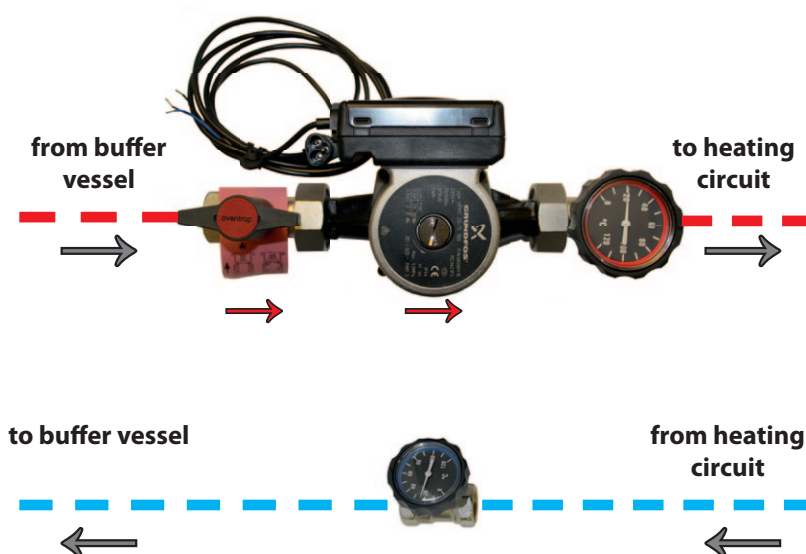


Fig. 52: Hydraulic schematic diagrams on the buffer discharge pump with shut-off set in the heating circuit flow



### Heating water filter assembly (TF1 total filter):

- Install the provided TF1 total filter according to the manufacturer instructions.  
**Positioning - see schematic diagram.**

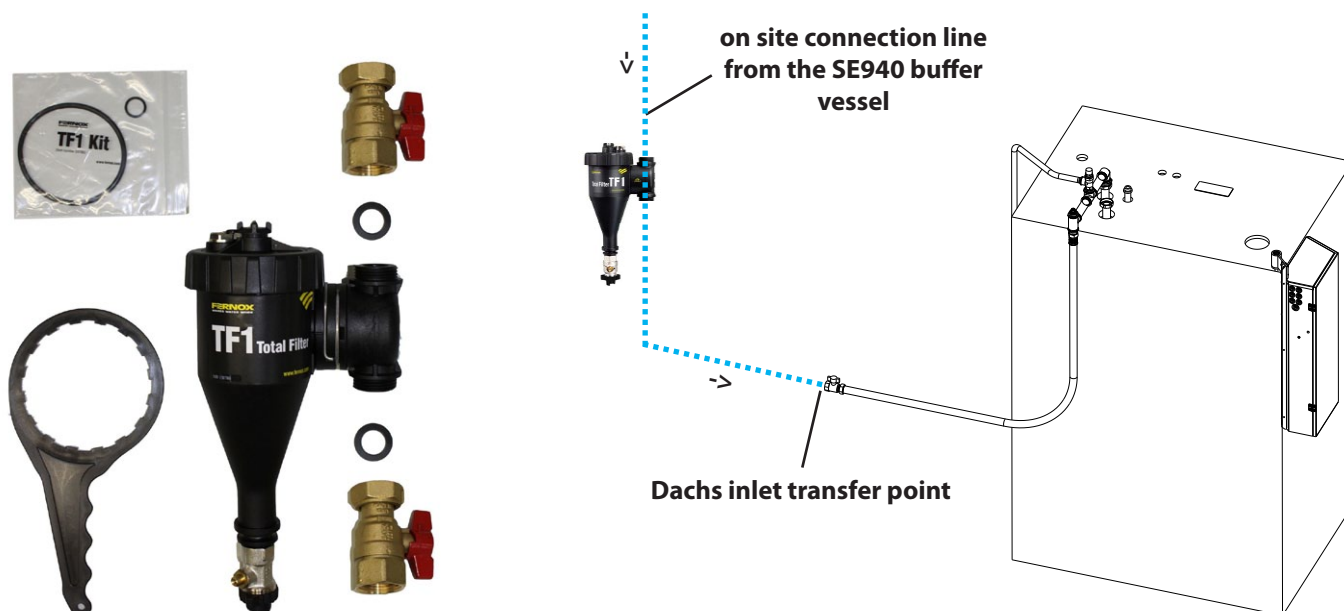


Fig. 54: TF1 total filter components and installation position - Fernox

### Membrane pressure compensation tanks:

Compensation tanks in closed central heating systems are equipment for storing heating water in case of volume changes due to heating/cooling.



#### Attention:

Installation of a pressure compensation tank is **compulsory!**  
**For the design, please observe DIN 4807 part 2.**

### Heat meter installation:



#### Note:

Regarding energy tax exemption, a gas meter or thermal energy meter **must** be installed on site. The manufacturer instructions for installation of the heat meter are to be observed.

### Pressure gauge installation:



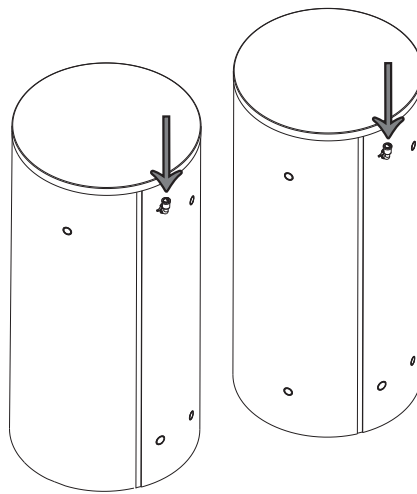
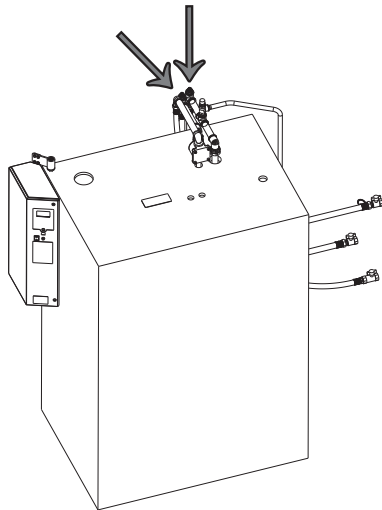
#### Note:

The scope of delivery of the Dachs Pro 20 ST includes a pressure gauge. This component is **only** required for installation if no separate sensor connection with pressure gauge is available on site.



## Hydraulic vent positions at the Dachs Pro 20 ST:

Manual vent at the Dachs outlet and Dachs inlet



Automatic vent at each SE940 buffer vessel

Fig. 55: Hydraulic vent positions at the Dachs Pro 20 ST



### Reference:

For hydraulic installations at the Dachs Pro 20 ST, particularly the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) are to be observed.

## 6.5 Solar component connection



### Note:

This chapter is currently not relevant for the Dachs Pro 20 ST.

## 6.6 Cooling circuit connection



### Note:

This chapter is currently not relevant for the Dachs Pro 20 ST.



## 6.7 Gas connection

### Reference:

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

**Chapter 3.9 - Technical data - Gas supply**

**Chapter 6.8 - CHP internal gas system**

**Chapter 6.9 - Gas supply**



### Dachs Pro 20 ST summary:

- The Dachs Pro 20 ST may only operated with natural gas (H or L).
- The Dachs Pro 20 ST is **not** designed for operation with biogas or liquefied petroleum gas (LPG).
- There is no possibility for modifying the CHP for other gas types or gas compositions.
- Admissible gas pressure: 18 - 25 mbar (operating pressure).
- The gas line has to be equipped with the following accessories: **Gas meter size BK-G6 (0.06 - 10 m<sup>3</sup>/h).**

### Note:

Installation may require a **GS 10 Type M** gas flow monitor. Local regulations apply.

Regarding energy tax exemption, a gas meter or thermal energy meter **must** be installed on site.



### Attention:

Gas installation is to be implemented in accordance with the technical regulations of the local gas suppliers and the TRGI/TRF and may only be carried out by specialist staff with respective authorisation for working with gas.



### Note:

The gas pressure of the supply line is to be checked already in the planning phase. If the pressure in the gas line exceeds 24 mbar (natural gas), a pressure reducer has to be installed to reduce the gas pressure at rest to a maximum of 20 mbar (natural gas).



### Dachs Pro 20 ST scope of delivery for gas connection:

- Gas connection hose.
- Gas shut-off unit with fire safety valve
- Gas filter (provided with the CHP).
- Installation material (fittings).



Fig. 56: Gas connection scope of delivery

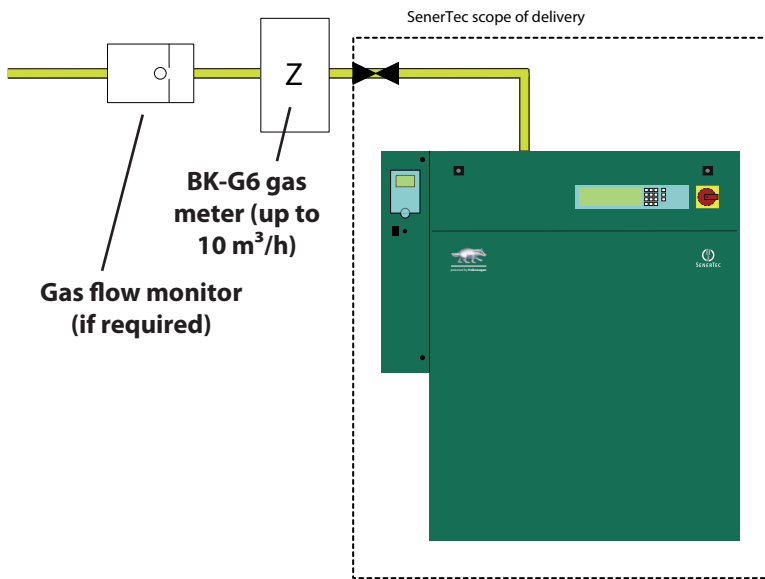
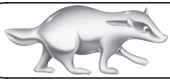


Fig. 57: Schematic diagram for gas connection to the Dachs Pro 20 ST

### Attention! Danger - if you smell gas:

- Extinguish all flames immediately!
- Open all windows and doors immediately!
- Close the shut-off unit at the gas meter or the main shut-off unit in the basement immediately!
- Do not use matches or lighters!
- Do not operate electrical switches!
- Do not disconnect electrical plugs!
- Do not operate electrical bells!
- Do not smoke!
- After closing the main shut-off unit, close the gas shut-off valve of the Dachs Pro 20 ST and check if the gas fittings of all devices are closed! Close the gas fittings that are still open (pilot light valves, gas refrigerators etc.)!
- Lights may only be switched on again when there is no longer any smell of gas!
- Do not rely on your own sense of smell and consult other persons!
- If the cause of the smell of gas cannot be identified although all gas fixtures are closed, the gas supplier has to be notified immediately. Even a faint smell of gas the cause of which cannot be determined has to be reported to the gas supplier!
- If a smell of gas comes from rooms that are not easily accessible, the police or fire department has to be notified immediately as they have the right to gain access. At the same time, the gas supplier has to be notified!
- If a gas leak is suspected in the basement, the basement has to be well ventilated but must not be entered. Inform all residents of the building as well as the gas supplier!
- Do not repair defects or damage at gas systems yourself! Defects of this kind may only be corrected by specialists commissioned by the gas supplier and their contractors!
- The location of the defect must be made accessible to the fault-clearing services!





## Gas line routing:

- Install the gas line close to the Dachs Pro 20 ST for connection of the gas hose.

## Leakage check at gas lines:

- Tighten the provided fire safety valve including shut-off valve (the 3/4" plug has to be removed first) at the end of on site gas line and carry out a pressure test of the gas line with the prescribed test pressure according to TRGI.

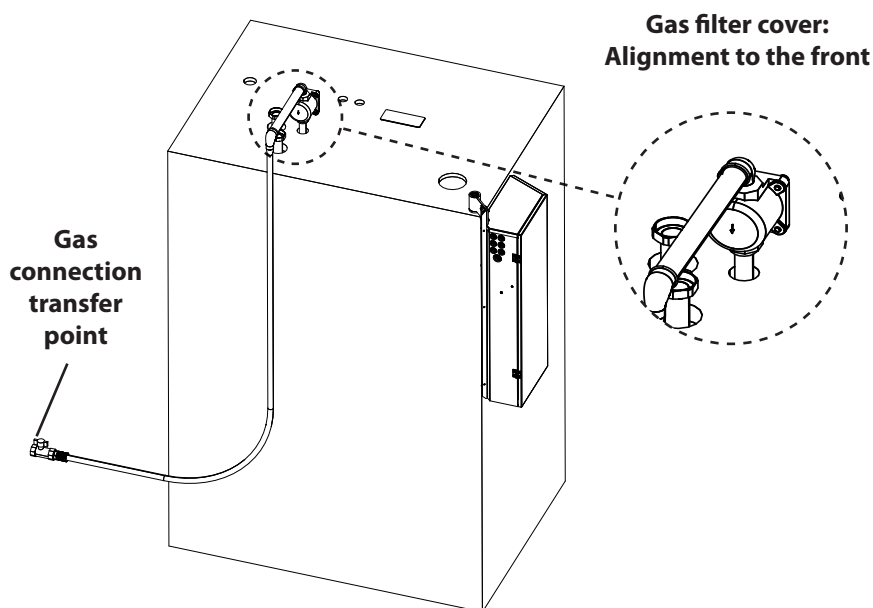


Fig. 58: Dachs Pro 20 ST rear view - assembled gas connection

## Assembly of the provided gas connection components:

### Step 1

- Tighten the gas filter ① at the 3/4" connection (gas connection) of the CHP.



#### Attention:

Observe the flow direction of the gas filter.

### Step 2

- Tighten one of the two 90° brackets ② at the top connection of the gas filter.

### Step 3

- Extend the gas connection using the pipe double nipple ③ by 30 cm to the rear.

### Step 4

- Tighten the 90° bracket ④. Alignment to the bottom.

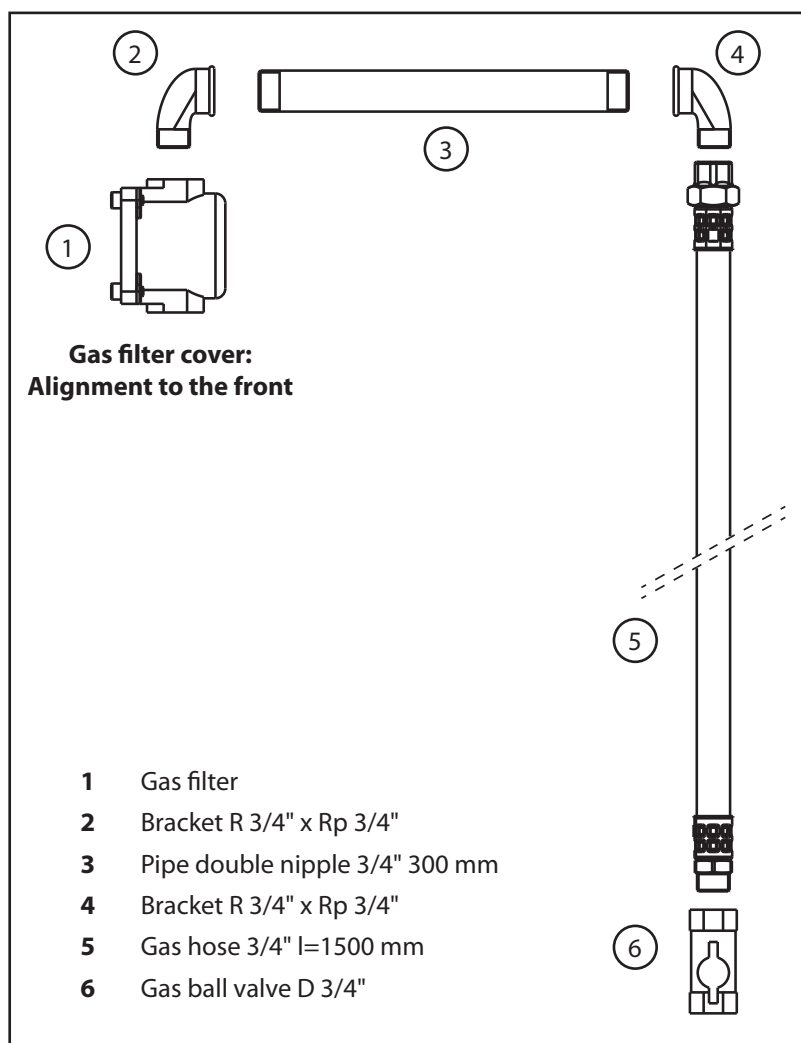


Fig. 59: Gas connection components



### Step 5

- ▶ Connect the gas ball valve ⑥ to the transfer point to the gas supply prepared on site.

### Step 6

- ▶ Tighten the gas hose ⑤ stress-relieved between the gas ball valve ⑥ and the 90° bracket ④.

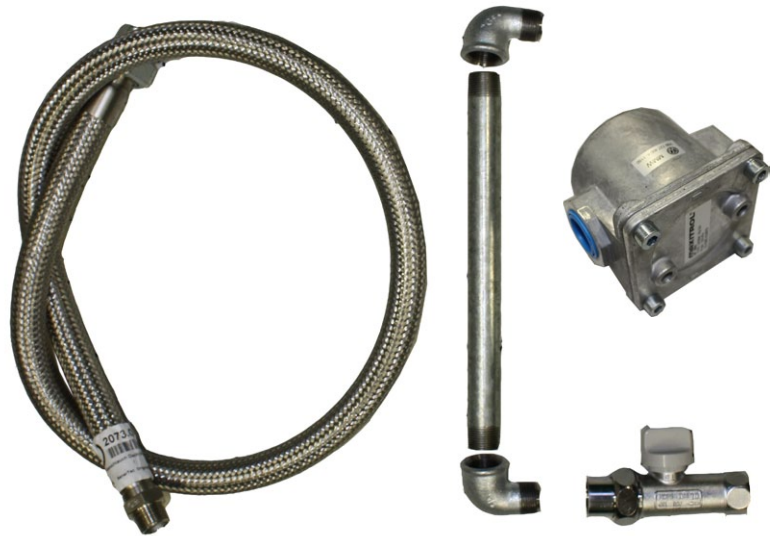


Fig. 60: Gas connection installation set

### Vent the gas line:



#### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.



#### Attention:

The gas hose including the internal gas duct may only be vented under supervision.

- ▶ Open the gas valve and ensure gas supply to the Dachs Pro 20 ST.
- ▶ Vent the gas line according to TRGI 8.1.1.1.3.
- ▶ After venting, close the vent valve at the gas fitting.



#### Attention:

Check whether the venting valve connection is gas tight.

- ▶ Finally, check the tightness by means of leak spray or a leak detection device to check the entire gas duct.

## 6.8 Oil supply connection



#### Note:

This chapter is not relevant for the Dachs Pro 20 ST.  
The fuel supply is realised exclusively using natural gas.



## 6.9 Exhaust gas/supply air system

### Reference:

Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapter 6.9.4 Exhaust gas system and fresh air supply** in particular.

### Extracts from the iav documentation of VW

The entire exhaust gas system is to be realised according to DVGW work sheet G640 "Installation of small-scale CHPs", DIN EN 1856, DIN EN 1443 and DIN EN 13384 point 6 "Exhaust gas routing for gas-fired appliances" and may only be configured by specialist personnel.

- During normal operation, exhaust gas temperatures of up to 200 °C may occur.
- The pressure loss in the exhaust gas system must not exceed 50 mbar. The connections may only be installed by specialist personnel.
- Fresh air supply and exhaust gas lines have to comply with the installation type (room-air-dependent). The air is taken in from the installation room. For this reason, appropriate ventilation of the installation room has to be provided.
- The maximum required fresh air is 80 kg/h.
- Applicable national regulations have to be complied with.

The combustion air is taken in via the air intake duct and supplied to the gas mixer via an air duct with air filter. Fresh air is added via an intake in the housing.

The interface to the exhaust gas outlet is to be realised at the top edge of the CHP using an external DN 50 thread.

It has to be ensured via the exhaust gas system that the maximum exhaust gas flow that may occur during operation is discharged. The exhaust gas system has to be designed gas-tight for the maximum pressures occurring during operation.

The exhaust gases of the CHP are discharged via an exhaust gas line. It is not designed for condensing mode.

The CHP is not equipped with a condensate discharge as the exhaust gas temperature is high enough to evaporate the condensate from the starting/cooling phase and discharge it with the exhaust gas.

### Attention! Damage due to condensate:

Condensate occurring in the exhaust gas system must not flow back into the CHP. This may lead to damage to the CHP.

### Attention:

The exhaust gas line has to be approved for exhaust gas temperatures of up to 200 °C.

The exhaust gas line has to comply with applicable regulations.

Exhaust gas discharge is intended via vibration-decoupled connection at the rear top of the CHP.





The exhaust gas system consists of the following components:

- Exhaust catalyser
- Exhaust gas heat exchanger
- Exhaust gas silencer

The exhaust gas silencer enables considerable noise reduction inside the unit under the present room conditions. The exhaust gas heat exchanger cools the exhaust gas from the CHP to an outlet temperature of 190 °C.



**Attention! Risk of burns:**

The exhaust gas system has to be insulated with suitable thermal insulation to prevent dangers of burning.

A condensate trap has to be integrated into the exhaust gas system outside the CHP.



**Attention! Risk of poisoning:**

To prevent the risk of poisoning due to escaping exhaust gas, the siphon of the condensate trap has to be filled with water.



**Exhaust gas system information:**

If the building is not equipped with a lightning arrester, equipotential bonding has to be attached to the bottom of the chimney.



**Attention! Danger:**

Supply air apertures must not be obstructed. Closed supply air apertures may lead to incomplete combustion as well as to the formation of carbon monoxide. This may lead to poisoning.

### 6.9.1 Exhaust gas system

For exhaust gas evacuation of the Dachs Pro 20 ST, a type-approved chimney and/or an exhaust gas duct **must** be used.

In cooperation with an exhaust pipe manufacturer, SenerTec has specified an appropriate pressure-tight and temperature-resistant exhaust gas system **designed for the Dachs Pro 20 ST**. Sufficient experience is only available for the specified exhaust gas system. For this reason, only this exhaust gas system is approved for the system test phase. Processing and delivery is managed directly by the manufacturer.

**Regarding project planning and order processing, please contact:**

Company: Raab GmbH  
Contact: Dirk Werner  
Address: Gladbacher Feld 5  
Post code, city: D - 56566 Neuwied  
Phone: +49 (0) 160 - 88 49 779  
E-mail: dirk.werner@raab-gruppe.de  
Internet: www.raab-gruppe.de


**Please note:**

The exhaust gas ducts must also be run over the roof **always according to DIN 18160**. Minimum clearances to dormers, windows or other openings are to be observed. The responsible chimney sweep must always be consulted when planning exhaust gas ducts.

**Please note:**

- The exhaust gas duct may only be installed in combination with the specified silencer.
- Multiple assignment with other heat generators or CHPs is **not** possible.
- After completion, the connection line of the Dachs Pro 20 ST in the installation room has to be insulated according to the temperature range (up to 200 °C) with suitable and approved aluminium-lined mineral wool (30 mm thick)

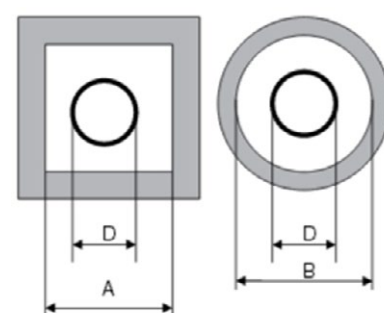
## 6.9.2 Exhaust gas line dimensioning base

Tab.9: Gas line dimensioning

Number of Dachs Pro 20 ST units per exhaust gas line	Number of possible deflections	Dimensioning of the horizontal exhaust gas line (unit up to duct)	Dimensioning of the vertical exhaust gas line (duct assembly)	According to DIN EN 13384-1 Potential diameters of the exhaust gas system
1	<b>max. 5 arcs (to be minimised)</b>	<b>0 - 10 m pipe length</b>	<b>0 - 30 m pipe length</b>	<b>Horizontal exhaust gas line DN 80</b>  <b>Vertical exhaust gas line optimally DN 100 alternatively DN 80</b>

Tab.10: Exhaust gas line minimum duct dimensions

Exhaust gas line minimum duct dimensions			
System	Outer fitting diameter	Shaft minimum internal dimensions	
	Diameter in mm	A in mm	B in mm
DN 80	94	135	155
DN 100	104	144	164





## 6.9.3 Exhaust gas line - DN80 package

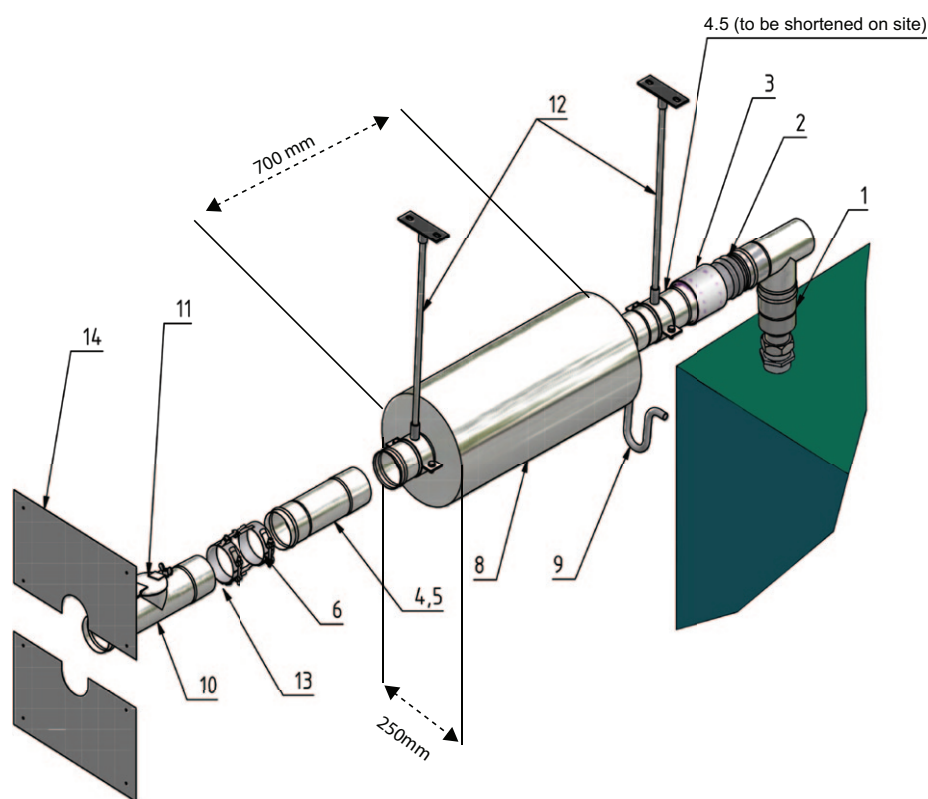


Fig. 61: Schematic diagram - DN80 exhaust gas line, horizontal

Tab.11: Exhaust gas line - DN80 package

No.	Designation
1	T-piece for deflection with 2" connection
2	Capacitor
3	Mechanical vibration absorber
4	Pipe element, 1000 mm
5	Pipe element, 500 mm
6	Assembly clamp fitting
7	Ceramax 150 g sealing paste
8	Silencer, AGG 760/50
9	Siphon 200 x 18 x 1 mm
10	T-piece with bolt
11	Crimping cover up to 200 °C
12	Floor/ceiling bracket
13	Compensation element
14	Panel sheets, 90°



#### 6.9.4 Exhaust gas line - DN100 (DN80) duct mounting

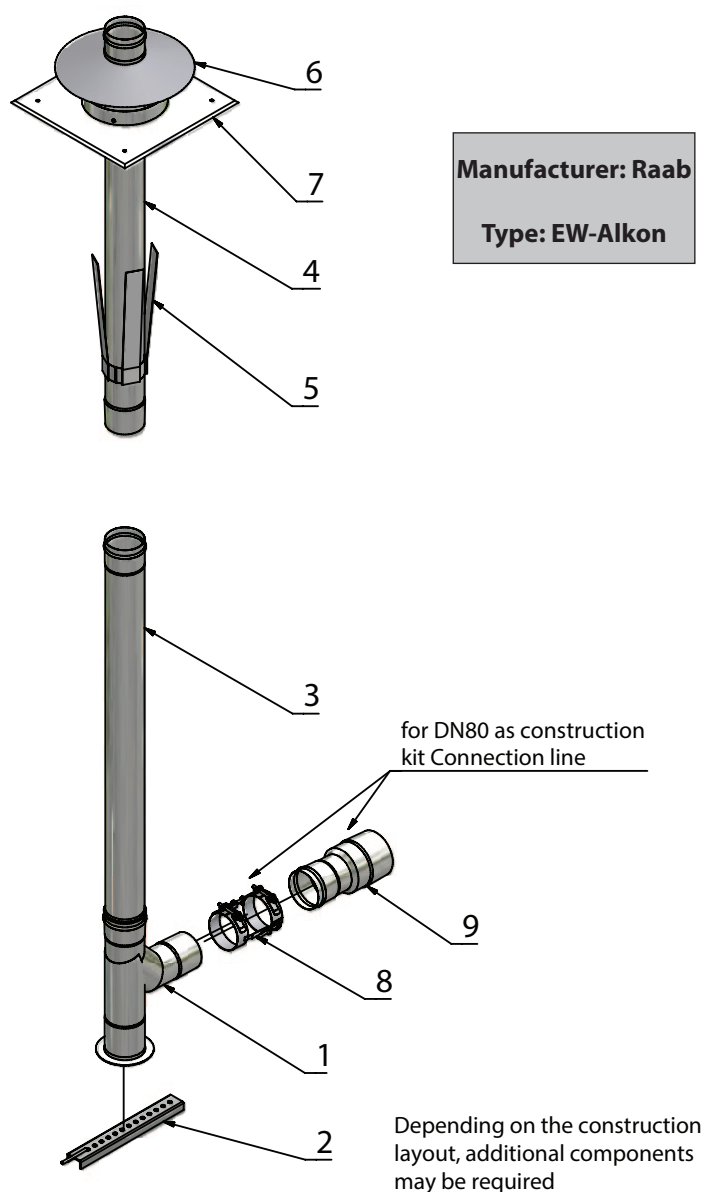


Fig. 62: Schematic diagram - Exhaust gas line in DN100 (DN80) duct, vertical

Tab.12: Exhaust gas line - DN100 duct mounting

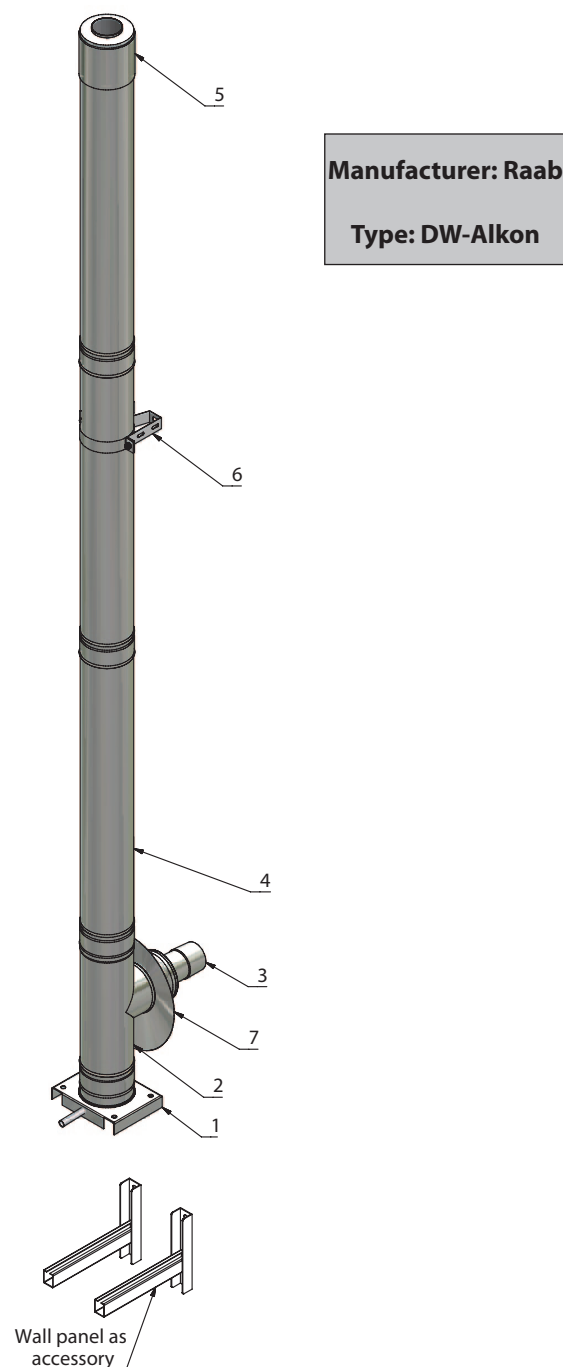
No.	Designation
1	87° arch with STFHV, 100 mm
2	Bearing rail 300 mm with threaded rod
3	Pipe element, 1000 mm, 100 mm, lug
4	Pipe element, 1000 mm, 100 mm
5	Spacer clips, 100 mm
6	Rain collar end element, 100 mm
7	Shaft access cover, 340/340, 100 mm

Tab.13: Exhaust gas line - DN80 duct mounting

No.	Designation
1	87° arch with STFHV, 80 mm
2	Bearing rail 300 mm with threaded rod
3	Pipe element, 1000 mm, 80 mm, lug
4	Pipe element, 1000 mm, 80 mm
5	Spacer clips, 80 mm
6	Rain collar end element, 80 mm
7	Shaft access cover, 340/340, 80 mm



## 6.9.5 Exhaust gas line - DN100 (DN80) external wall



Tab.14: Exhaust gas line - DN100 (DN80) external wall

No.	Designation
1	Bottom part for wall/floor assembly
2	87° angle with support stand
3	V-connection, DW-Alkon to EW-Alkon
4	Pipe element, 1000 mm
5	End element
6	Wall mounting, static, 60 mm clearance
7	Wall rosette

Fig. 63: Schematic diagram, DN100 (DN80) external wall exhaust gas line, vertical



### For wall mountings, please note:

- Every 4 meters, wall fittings are to be installed.
- 3 meters of free overhang with static clamp fitting.
- 1.5 meters of free overhang without static clamp fitting.



## 6.10 Electrical connection

For all installation work, in particular with respect to protective measures, the respective standards and regulations are to be complied with.

Explicit reference is made to the series of DIN VDE 0100, particularly 0100-100, 0100-551, 0100-410 and 0100-430, VDE-AR-N 4105, TCR of distribution network operators and potential special requirements:

- DIN VDE 0100-551 *Low-voltage electrical installations - Low-voltage generating sets, DIN VDE 0100-410 Low-voltage electrical installations - Protection for safety - Protection against electric shock.*
- DIN VDE 0100-430 *Low-voltage electrical installations - Protection for safety - Protection against overcurrent.*
- VDE-AR-N 4105 *Generator units with low-voltage distribution networks - Technical minimum requirements for generator units to be connected to and operated in parallel with low-voltage distribution networks.*
- DIN VDE 0100-100 *Low-voltage electrical installations - Part 1: Fundamental principles, assessment of general characteristics, definitions.*

### Attention:

According to DIN VDE 0100-551 and VDE-AR-N 4105, the grid connection must not be implemented at an end electrical circuit. The connection has to be fixed (no plug) e.g. in a power distribution panel (sub-distribution) and via an isolating unit with a minimum contact clearance of 3 mm (e.g. fuse, LS switch). Other consumer loads may not be branched off at the grid connection terminals.

### Attention:

Electric installation as well as electric connection of the Dachs Pro 20 ST must only be carried out by authorised electricians.

### Number of supplies / determination of CHP net electricity generation:

#### CHP and MSR Pro 20 ST require separate grid connections.

Please note explicitly the following schematic diagrams and references to particular documentations to ensure proper electrical connection of all components.

Due to the frequency converter, **no** residual current device (RCD) may be installed in the CHP supply (see schematic diagram).

### Reference:

For CHP connection, please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) on electrical connections in particular. For example:

- *VW EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.
- *Circuit diagram extracts - VW EcoBlue 2.0 (Generation 1.2)*, art. no. 4798.537.xxx.



Z1:	Meter for consumption and supply (bidirectional meter) Supply: Metering of the supply into the grid of the distribution network operator for sale, e.g. according to market conditions (European Energy Exchange) and avoided network tariffs
Z2:	Meter for metering the generated CHP net electricity (meter with non-return device)
RCD:	Residual current device

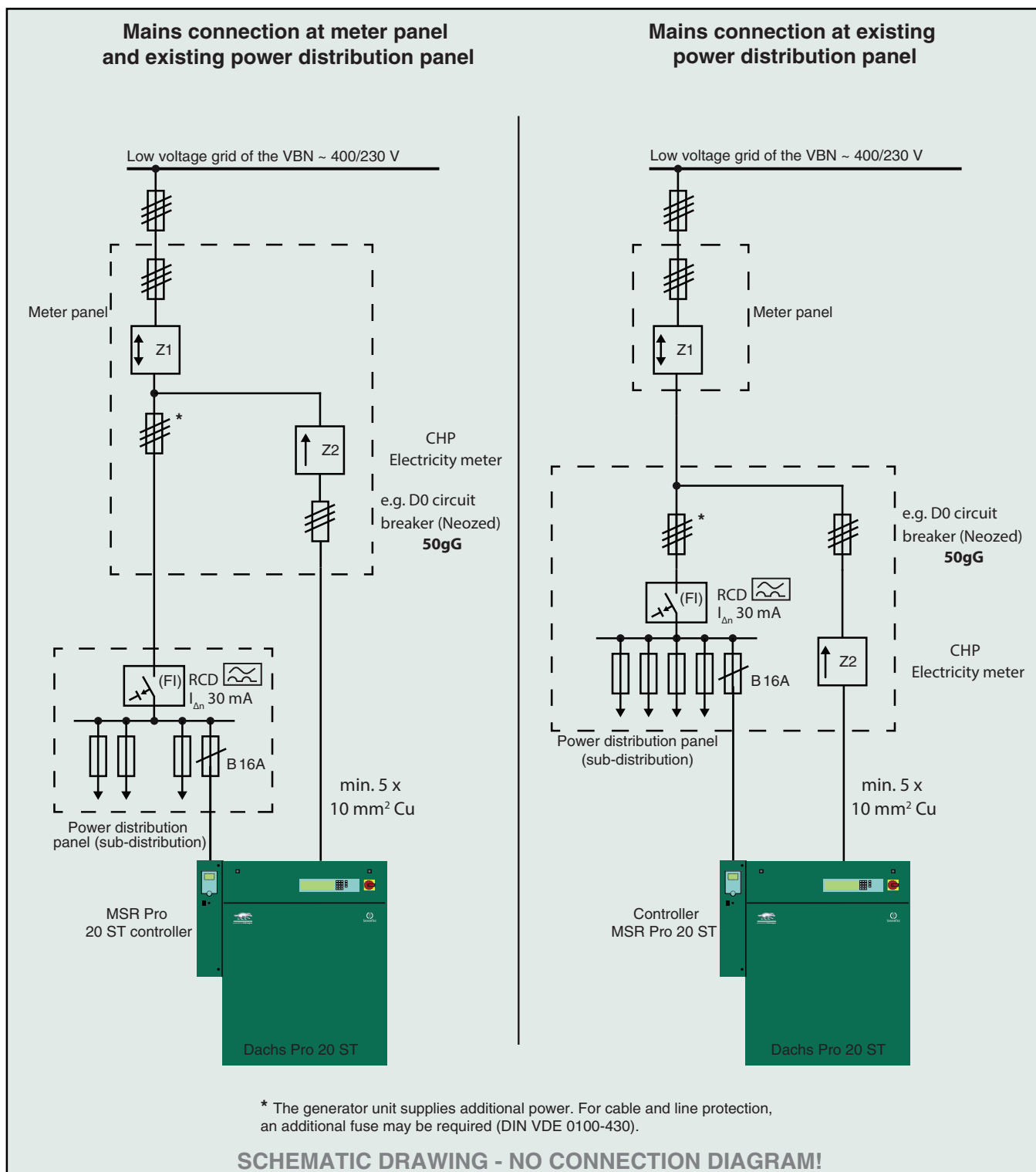


Fig. 64: Schematic diagram of Dachs Pro 20 ST grid connections



#### Additional information on CHP net electricity metering:

At the CHP supply, CHP net electricity generation can be metered according to the German Combined Heat and Power Act (KWKG) 2009.

#### Extract from the German Combined Heat and Power Act (KWKG) 2009:

"Net electricity generation refers to the electricity generated by an unit measured at the generator terminals reduced by the unit consumption for operation."



#### CHP net electricity generation metering according to the German Combined Heat and Power Act (KWKG) 2009:

To sell the electricity generated by the CHP unit, a CHP electricity meter has to be installed in addition to the supply and consumption meters (usually a bidirectional meter).

#### Meter and meter installation

According to the CHP act, operators are entitled to install a metering unit (CHP electricity meter). The meter has to comply with calibration regulations and must be equipped with a non-return device. There are different types of meters. SenerTec recommends mechanical meters as these are calibrated for 16 years. A technical solution would be a calibrated bus bar meter in an electrical circuit distribution.

This is the latest information at time of printing.



#### Attention:

The installation position of the meter has to be coordinated with the respective distribution network operator (DNO). The installation is carried out by the authorised electrician in coordination with the distribution network operator.

#### Protection devices and line lengths:

The Dachs Pro 20 ST grid connection is to be protected at the connection to the

- **CHP with 3 × 50 gG (D0 load break switch [Neozed])** and to the
- **MSR Pro 20 ST with 1 × B 16A.**

To minimise line losses and avoid shut-downs due to overvoltage, minimum voltage drop is to be ensured when dimensioning the connection lines. The connection line has to be dimensioned according to the protection device, line length and line routing. The cross section must always be **5 × 10 mm<sup>2</sup> for the CHP** and **3 × 1.5 mm<sup>2</sup> for the MSR Pro 20 ST**.





## 6.10.1 CHP grid connection (CHP unit)

### Reference:

For CHP connection, please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) on electrical connections in particular. For example:

- *VW EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.
- *Circuit diagram extracts - VW EcoBlue 2.0 (Generation 1.2)*, art. no. 4798.537.xxx.

The detailed circuit diagram of the VW EcoBlue 2.0 (Generation 1.2) is available as PDF for download in the partner area of the SenerTec website.

- ▶ Route the mains supply to the CHP according to the iav documentation of VW.
- ▶ Connect the mains supply to the **X1** port of the E-Module at the CHP according to the iav documentation of VW.

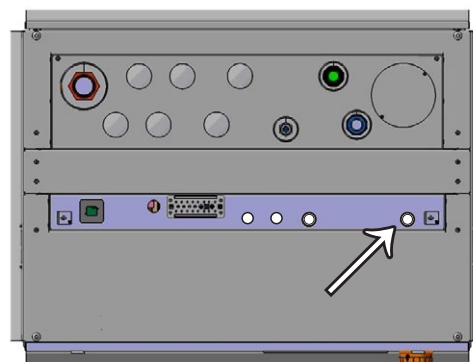


Fig. 66: CHP grid connection port

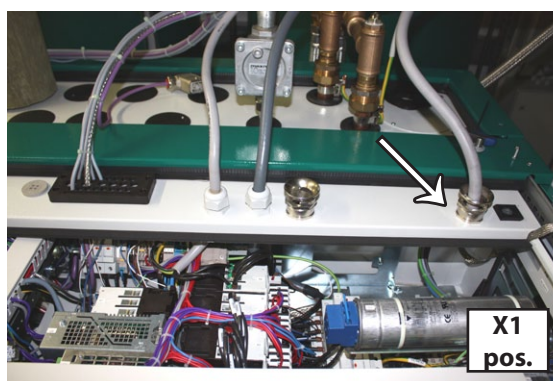


Fig. 67: CHP grid connection port

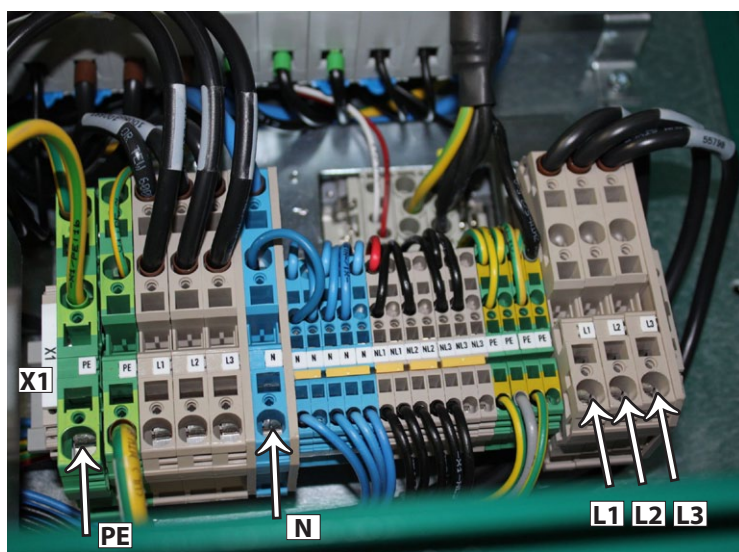


Fig. 65: **X1** grid connection in CHP

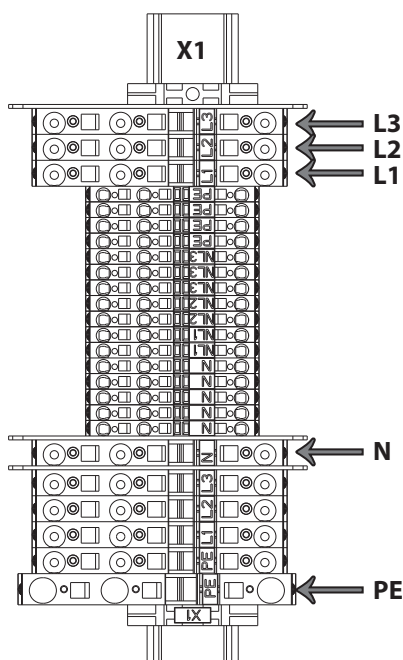


Fig. 68: Terminals - **X1** grid connection in CHP



## 6.10.2 Electrical connection of the frequency converter to the CHP

### Reference:

For frequency converter connection, please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular. For example:

- *Dachs Pro 20 ST frequency converter connection*, art. no. 4798.536.xxx.
- *VW EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.
- *Circuit diagram extracts - VW EcoBlue 2.0 (Generation 1.2)*, art. no. 4798.537.xxx.

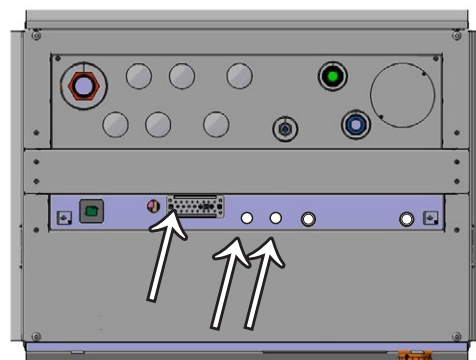


Fig. 69: Frequency converter cable harness connection



Fig. 70: Frequency converter cable harness

- ▶ Route the cable harness of the frequency converter to the CHP according to the iav documentation of VW.
- ▶ Connect the cable harness of the frequency converter to the CHP according to the iav documentation of VW.
- ▶ Connect the cable harness of the frequency converter to the frequency converter according to the iav documentation of VW.

### Note:

The cable harness of the frequency converter consists of three parts:

- **Supply** (5×6 mm<sup>2</sup>)
- **Return line** (4×6 mm<sup>2</sup> + 2×1 mm<sup>2</sup>)
- **Control line** (4×1 mm<sup>2</sup>)

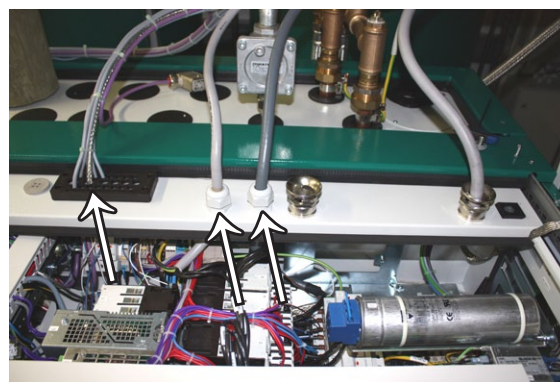
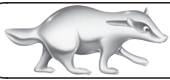


Fig. 71: Connection of the frequency converter cable harness to the CHP.



Fig. 72: Frequency converter control cabinet



### 6.10.3 Connection of the CO sensors to the CHP

- ▶ Install the two provided CO sensors inside the installation room according to the manufacturer instructions.

#### Reference:

For CO sensor assembly and connection to the CHP, please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular. For example:

- *VW EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx - **particularly chapter 6.12.**
- *Circuit diagram extracts - VW EcoBlue 2.0 (Generation 1.2)*, art. no. 4798.537.xxx.



Fig. 73: CO sensors

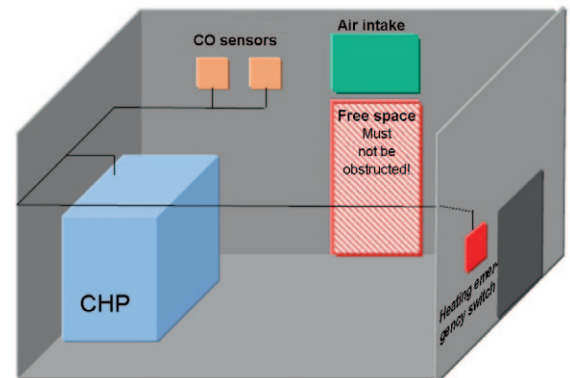


Fig. 74: CO sensor positioning

### 6.10.4 MSR Pro 20 ST grid connection

- The electrical grid connection is to be realised according to the provided schematic diagrams.

Separate supply with  $3 \times 1.5 \text{ mm}^2$

- ▶ Remove one stepped nipple at the rear of the controller housing.
- ▶ Slide the removed stepped nipple over the grid supply.
- ▶ Insert the grid supply from the outside into the controller.
- ▶ Secure the stepped nipple inside the controller housing.
- ▶ Connect the **L**, **N** and **PE** ports of the supply to the spring type terminals at the **X0** connection bar.
- ▶ Secure the grid supply with 2 cable ties at the strain relief rail.

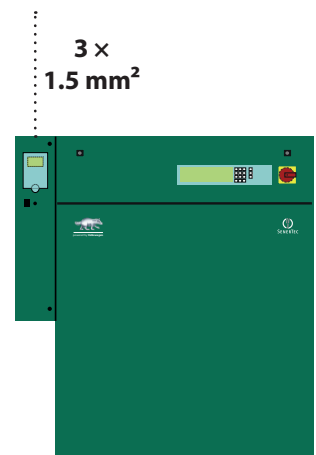


Fig. 75: Grid connection at the MSR Pro 20 ST

#### Attention:

Ensure secure fitting of the connection at the spring-type terminals of the **X0** connection bar.

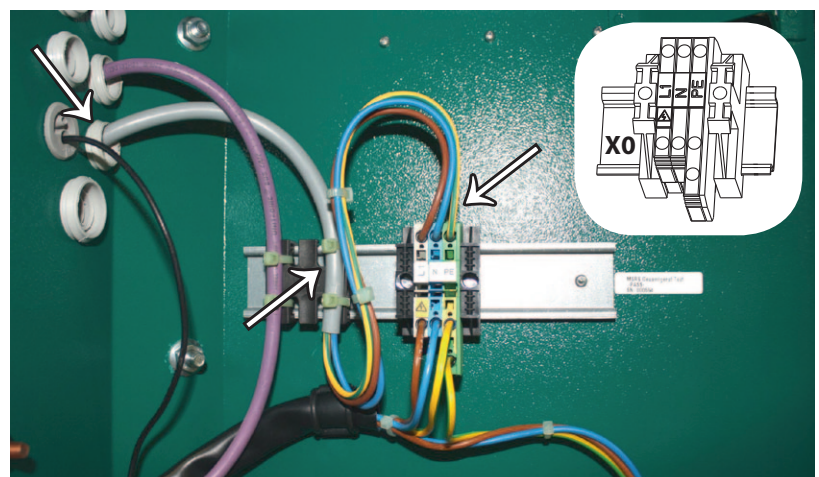


Fig. 76: **X0** grid connection in the MSR Pro 20 ST

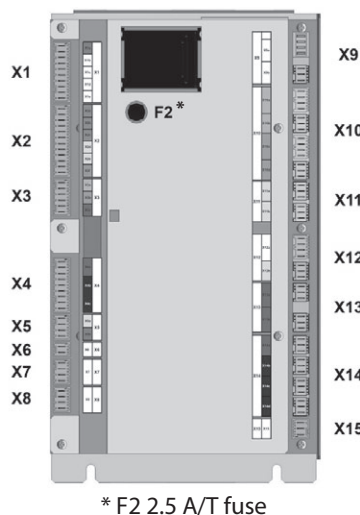




### 6.10.5 Connections in the MSR Pro 20 ST

Connection bar	Plug designation	Use
X1	X1a	External sensor (AF)
	X1b	Buffer vessel sensor 1 (F1)
	X1c	Buffer vessel sensor 2 (F2)
	X1d	Buffer vessel sensor 3 (F3)
	X1e	Buffer vessel sensor 4 (F4)
X2	X2a	F5
	X2b	F6
	X2c	F7
	X2d	-
	X2e	Prog. input
	X2f	Prog. input
X3	X3a	-
	X3b	-
	X3c	-
X4	X4a	-
	X4b	Pulse input 1
	X4c	Pulse input 2
X5	X5a	PWM signal
	X5b	-
X6	X6	-
X7	X7	CAN bus controller PCB
X8	X8	-

#### MSR Pro 20 ST power board



#### Details:

##### X5a connector

PWM signal buffer discharge pump

Ground (blue) → G

PWM output (brown) → P1

PWM input (black) not required



#### 230 VAC

Connection bar	Plug designation	Use
X9	-	-
	X9a	MSR Pro 20 ST mains supply 230 V~/50 Hz (6.3 A/T prefuse)
	X9b	-
X10	X10a	-
	X10b	-
	X10c	-
	X10d	-
X11	X11a	prog. output 230 V~/50 Hz (max. 250 VA)
	X11b	prog. output 230 V~/50 Hz (max. 250 VA)
X12	X12a	-
	X12b	-
X13	X13a	-
	X13b	-
X14	X14a	-
	X14b	Discharge pump control (max. 250 VA)
	X14c	-
	X14d	-
X15	X15	-

#### Cable routing information:

Sensor lines do not conduct mains voltage and must not be installed in parallel to the live lines (separate installation). Otherwise, screened lines are to be installed.

#### Sensor connection lines:

Cu line up to 30 m: min. 0.6 mm<sup>2</sup>.

Cu line up to 45 m: min. 0.8 mm<sup>2</sup>.

Cu line up to 60 m: min. 1.0 mm<sup>2</sup>.

Cu line up to 90 m: min. 1.5 mm<sup>2</sup>.

**Line types:** e.g. LiYY or LiYCY (screened).

#### Connection line ports at the MSR Pro 20 ST:

- Route all sensor cable harnesses as well as the connection lines of the buffer discharge pump from the **bottom** into the controller. Secure the respective connection lines with cable ties at the **bottom** stress relief rail.
- The grid supply for the MSR Pro 20 ST as well as the connection lines for communication (GSM antenna, CAN bus cable harness) are to be inserted from the **top** through the openings in the controller back wall (position of the stepped nipples) of the MSR Pro 20 ST. These connection lines are to be secured at the top stress relief rail using cable ties.



## External sensor (AF) connection

From experience, the north or north west wall are suitable for installation of the outside temperature sensor. However, if the building is heated using several separately controlled heating circuits, the outside temperature sensor has to be installed at the outer wall of the building section with the heating circuit connected to the Dachs.

Install the outside temperature sensor at a height of **approx. 2-2.5 m**.

If the building has multiple storeys, the sensor is to be installed in the top half of the second storey. Prevent undesired impacts on the sensor by avoiding installation positions over windows, doors, ventilation ducts and directly under balconies or rain pipes.

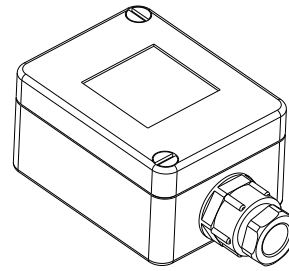


Fig. 77: External sensor (AF)

- ▶ Install the external sensor provided in the scope of delivery to the building.
- ▶ Route the sensor line to the MSR Pro 20 ST. Please note the dimensioning of the sensor line according to the distance to the external sensor.
- ▶ Insert the sensor line from the bottom into the controller.
- ▶ Connect the sensor line to the **X1a** connector.
- ▶ Secure the sensor line with cable ties at the bottom stress relief rail of the MSR Pro 20 ST.

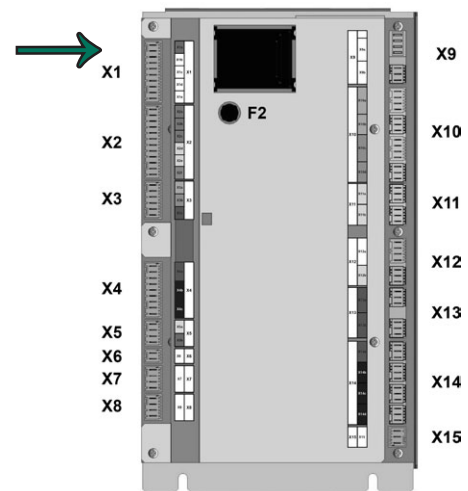


Fig. 78: External sensor (AF) connection

## F1-F4 sensor connection (buffer vessel sensor)

- ▶ Route the already assembled sensor cable harnesses to the MSR Pro 20 ST.
- ▶ Insert the sensor line from the bottom into the controller.
- ▶ Connect the connection lines of the sensor cable harnesses to the respective **X1b, X1c, X1d, X1e** connectors.

**Sensor F1 - connection to X1b**

**Sensor F2 - connection to X1c**

**Sensor F3 - connection to X1d**

**Sensor F4 - connection to X1e**

- ▶ Secure the sensor lines with cable ties at the bottom stress relief rail of the MSR Pro 20 ST.

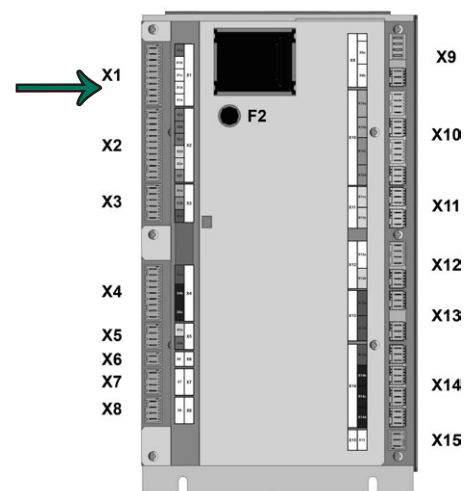


Fig. 79: F1-F4 sensor connection

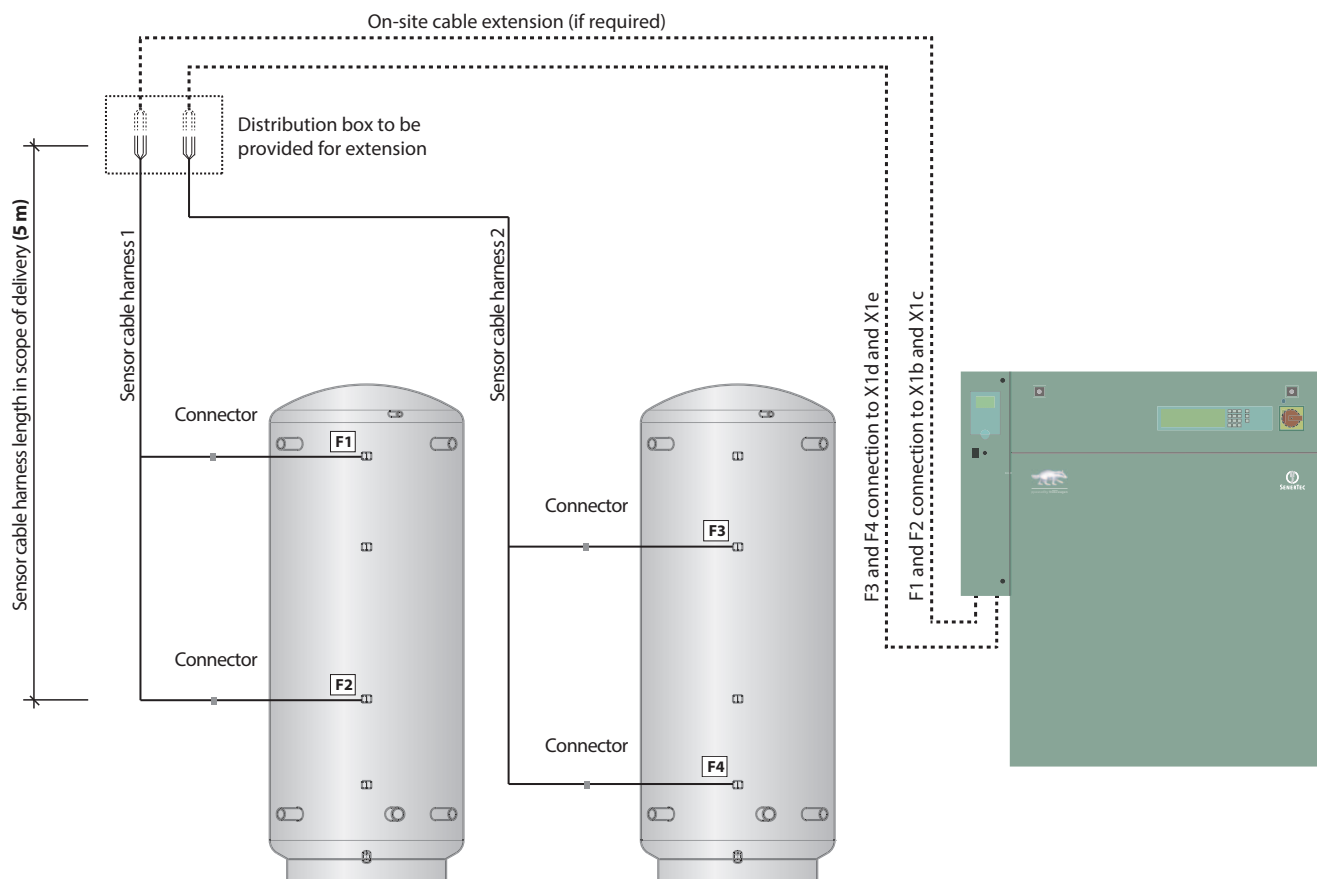


Fig. 80: Schematic diagram - Sensor cable harness extension

### F5, F6 and F7 sensor connection

- Position and assemble the sensors F5, F6 and F7 at the installation on site according to the hydraulic schematic diagrams. For sensor mounting, suitable tension straps are provided in the scope of delivery of the unit.
- Route the sensor lines to the MSR Pro 20 ST. Please note the dimensioning of the sensor line according to the distance to the F5, F6 and F7 sensors.
- Insert the sensor line from the bottom into the controller.
- Connect the connection liens of the sensor cable harnesses to the respective **X2a, X2b, X2c** connectors.

**Sensor F5 - connection to X2a**

**Sensor F6 - connection to X2b**

**Sensor F7 - connection to X2c**

- Secure the sensor lines with cable ties at the bottom stress relief rail of the MSR Pro 20 ST.

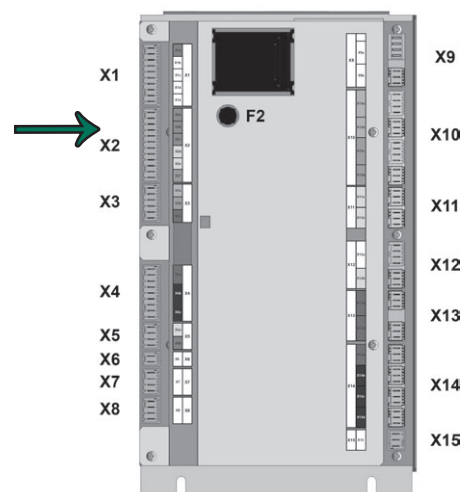


Fig. 81: F5, F6 and F7 sensor connection

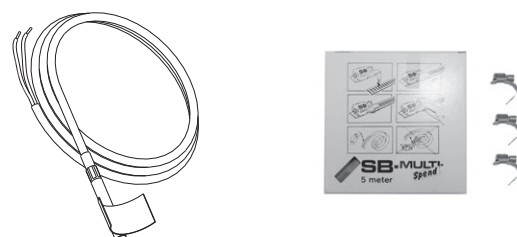


Fig. 82: Contact sensor and tension strap



## Buffer discharge pump connection

- ▶ Route the connection lines of the buffer discharge pump to the MSR Pro 20 ST.  
Insert the sensor line from the bottom into the controller.

### Note:

The connection lines in the scope of delivery have a length of 2 m and may need to be extended. Refer to the schematic diagram.

- ▶ Connect the connection lines to the respective **X5a** and **X14b** connectors.

### PWM signal - connection to X5a

### Control (voltage supply) - connection to X14b

- ▶ Secure the sensor lines with cable ties at the bottom stress relief rail of the MSR Pro 20 ST.

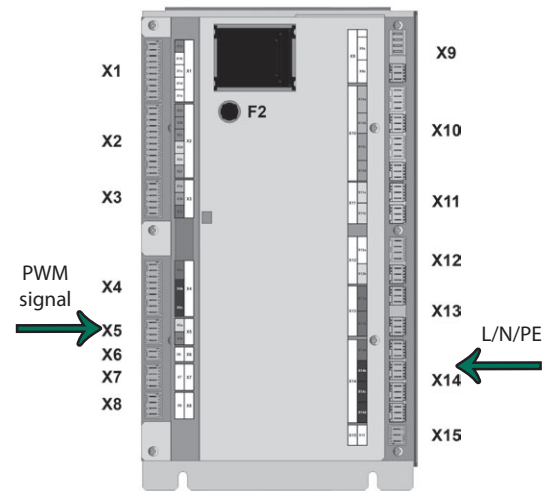


Fig. 83: Buffer discharge pump connection

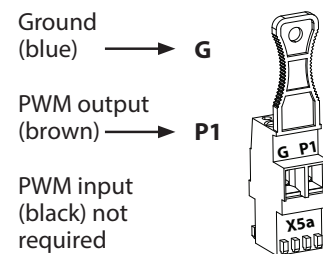


Fig. 84: PWM signals connection to X5a

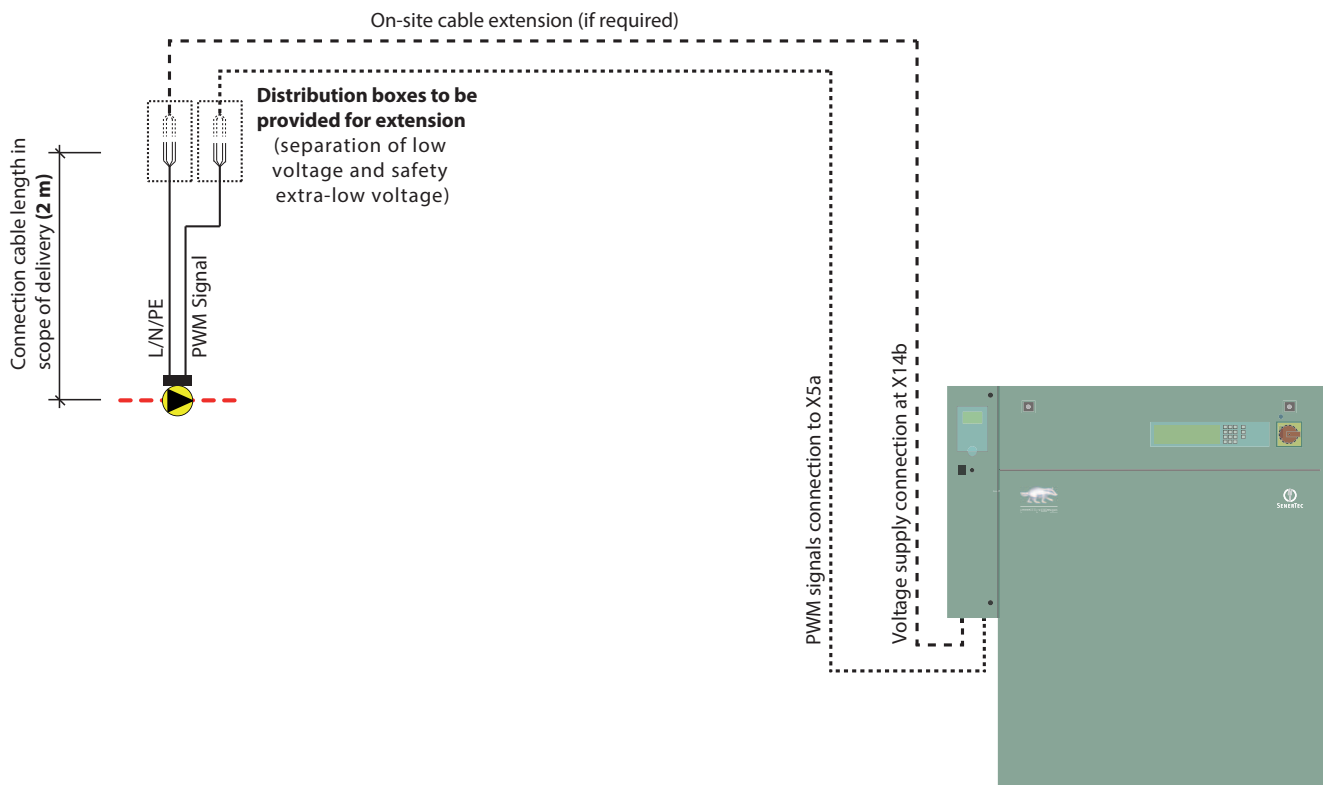


Fig. 85: Schematic diagram - Buffer discharge pump connection line extension



## CAN bus cable harness connection



### Note:

The communication between CHP and MSR Pro 20 ST is realised via a CAN bus connection.

Route and install the CAN bus cable harness provided in the scope of delivery.

- ▶ Remove one stepped nipple at the rear of the controller housing.
- ▶ Insert the cable harness from the outside into the controller.
- ▶ Secure the stepped nipple of the cable harness inside the controller housing.
- ▶ Route the cable harness to the controller PCB as illustrated.
- ▶ Connect the connector to the **left port** at the controller PCB.
- ▶ Secure the cable harness as illustrated with two cable ties and the rubber lug at the controller housing.
- ▶ Secure the connection line with 2 cable ties at the strain relief rail.



### Attention:

Make sure that the connection line is routed without tension and that the controller hatch can be opened and closed freely.

- ▶ Route the cable harness to the CHP and connect it to the E-Module as illustrated.

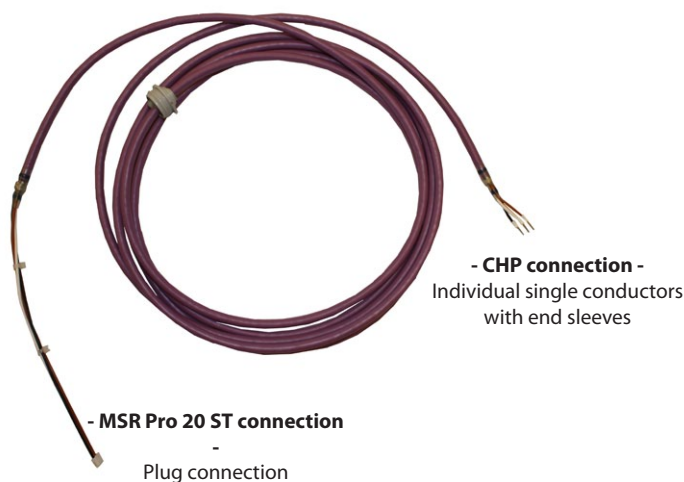


Fig. 86: CAN bus cable harness



Fig. 87: CAN connection in the MSR Pro 20 ST

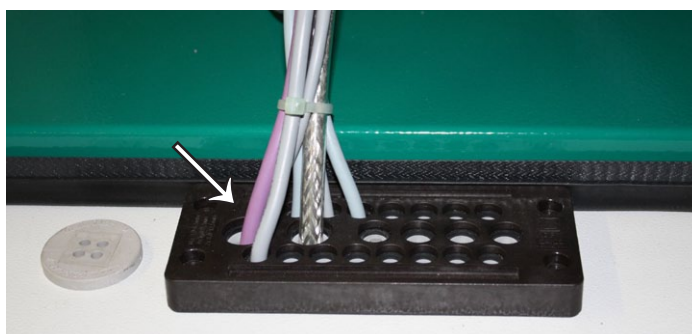


Fig. 88: CAN connection port at CHP





- ▶ Route the cable harness to the CHP and connect it to the E-Module as illustrated.
- ▶ Connect the cable harness or the single conductors with end sleeves to the CHP controller.

### Reference:

For CAN bus cable harness connection, please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular. For example:

- *VW EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.
- *Circuit diagram extracts - VW EcoBlue 2.0 (Generation 1.2)*, art. no. 4798.537.xxx.

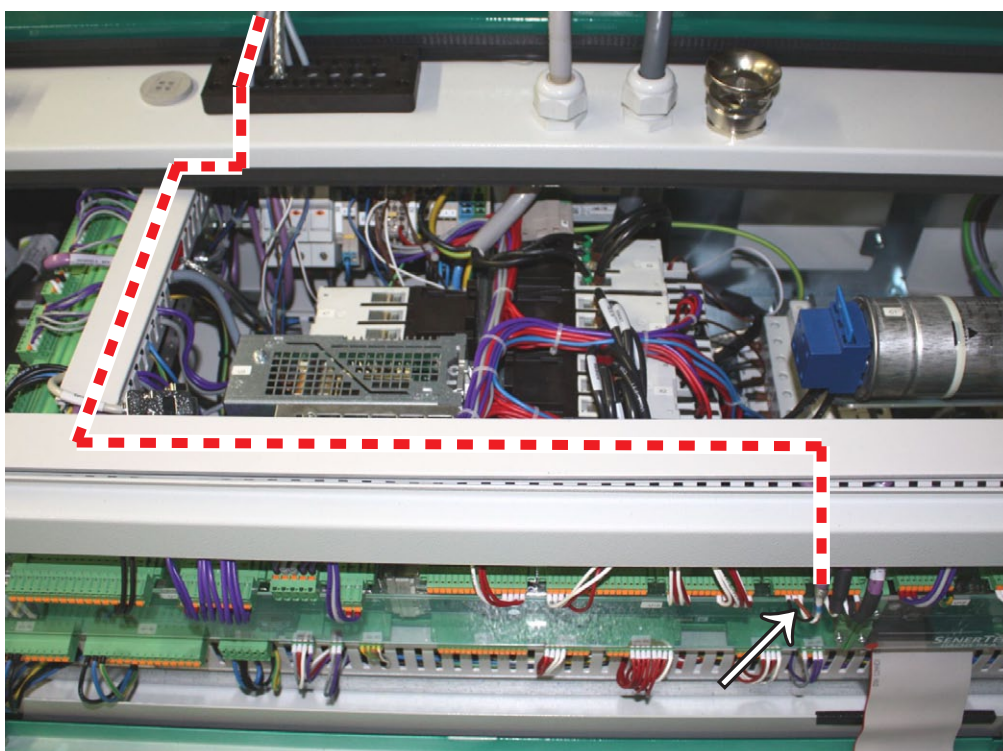
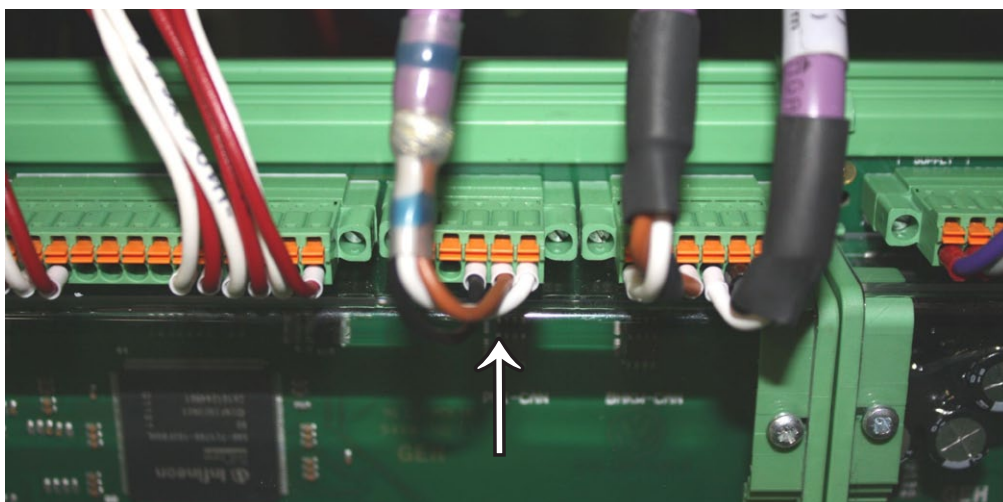


Fig. 89: CAN connection port at CHP



### U10 connection to PSI-CAN (CHP E-Module)

X8-3 single conductor,  
black (bk)

X8-4 single conductor,  
brown (bn)

X8-5 single conductor,  
white (wh)

Fig. 90: CAN connection to the CHP



### GSM antenna connection

- ▶ Remove one stepped nipple at the rear of the controller housing.
- ▶ Insert the connection cable harness of the GSM antenna from the outside into the controller.
- ▶ Attach the provided slotted bushing in the controller housing.
- ▶ Route the connection line to the controller PCB as illustrated.
- ▶ Connect the connector to the GSM modem adapter.
- ▶ Secure the connection line as illustrated with two cable ties and the rubber lug at the controller housing.
- ▶ Position the GSM antenna in the centre on top of the controller housing.

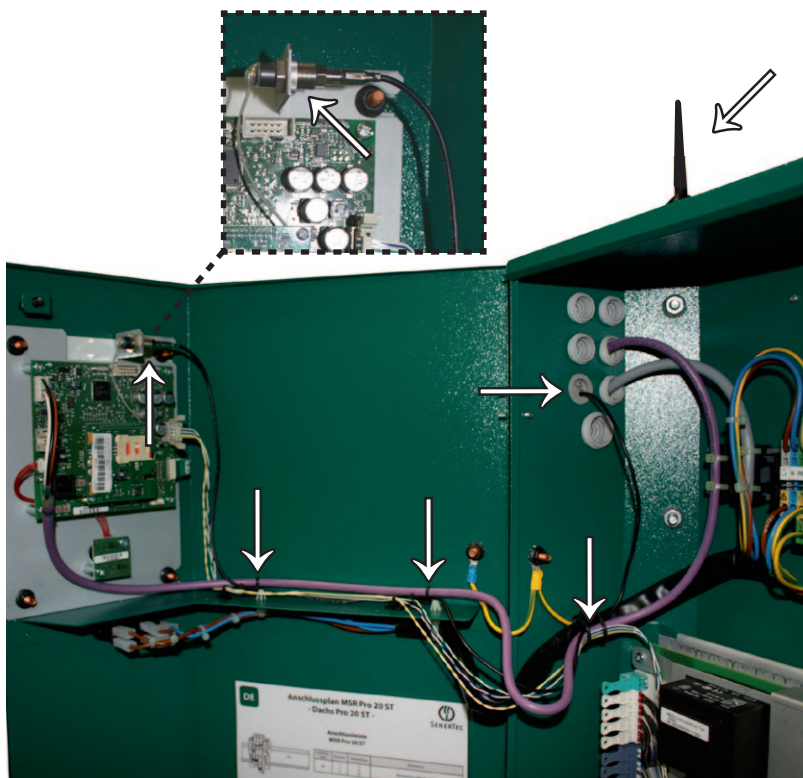


Fig. 92: GSM antenna connection in the MSR Pro 20 ST

### 6.10.6 Dachs Pro 20 ST equipotential bonding

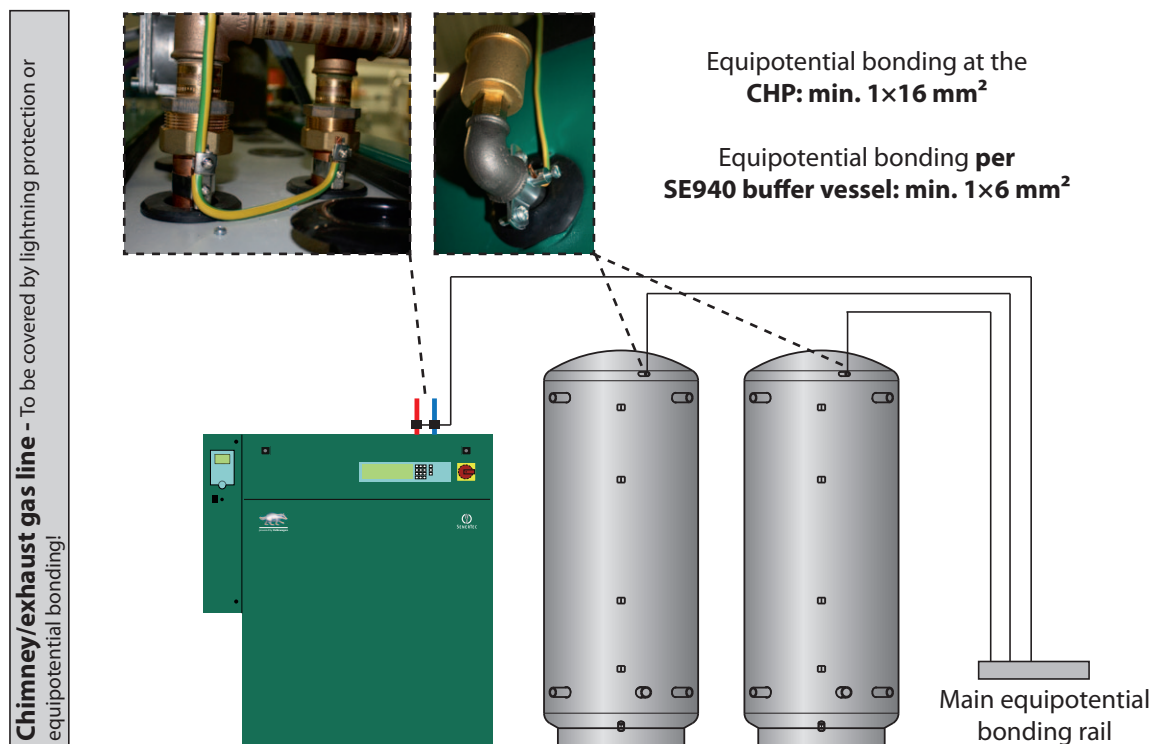


Fig. 91: Dachs Pro 20 ST equipotential bonding



### 6.10.7 Heating emergency switch connection

To ensure that the CHP can be switched off in case of emergency, an external heating emergency switch **must** be connected.

The heating emergency switch is **not** included in the scope of delivery and **must be provided on site**.

The heating emergency switch has to be installed outside of the installation room. When the heating emergency switch is pressed, CHP operation as well as all energy supplies to the CHP via gas line, generator and ignition are disconnected. The control system of the unit remains operational and the respective components remain live. After resetting the heating emergency switch, the unit starts automatically.

#### Reference:

For heating emergency switch connection, particularly the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) are to be observed. For example:

- *VW EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx - **particularly chapter 6.13.**
- *Circuit diagram extracts - VW EcoBlue 2.0 (Generation 1.2)*, art. no. 4798.537.xxx - **page 5.**

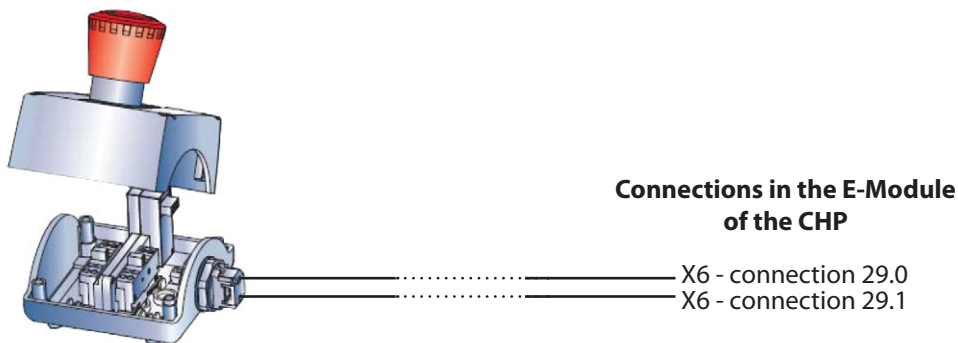


Fig. 93: Schematic diagram - Heating emergency switch connection

- After completion of the electric installation, the adhesive label (art. no. 4763.176.xxx - provided with the MSR Pro 20 ST controller) has to be attached to the main distribution and potentially also in the sub-distribution.

**Achtung! Attention!  
Attenzione! ¡Atención!**

**DE** In diesem Gebäude ist eine Eigenzeugungsanlage in Betrieb.  
Vor Arbeiten an der Elektroinstallation muss der Erzeuger ausgeschaltet werden.

**GB** A CHP generating unit is in operation in this building.  
Before any electrical work is carried out, the CHP must be switched off.

**IT** In questo edificio é in funzione un microgeneratore.  
Prima di qualsiasi intervento sull'impianto elettrico, l'unità deve essere spenta.

**ES** Generador en la operación en este edificio.  
Antes de cualquier trabajo eléctrico, el generador se debe apagar.

**FR** Générateur en fonction dans ce bâtiment.  
Avant n'importe quel travail électrique, le générateur doit être coupé.

4763.176.001

Der Aufkleber muss an der Elektroverteilung angebracht werden.  
This sticker must be placed on the building elec. incoomer and  
also on the sub distribution.  
Questo adesivo deve essere applicato sul quadro principale di  
distribuzione.  
Esta etiqueta se debe poner en la caja de distribución eléctrica.  
Cet autocollant doit être placé sur la boîte de distribution électrique.

Fig. 94: Adhesive label: Main/sub-distribution



## 6.11 Filling the unit

### Note:

The Dachs Pro 20 ST is equipped with a system separator in the CHP. The primary circuit of the CHP is already filled on delivery and just needs to be checked/refilled on commissioning. The secondary circuit of the CHP or the total volume of the buffer vessels including lines to the heating circuit have to be filled with prepared heating water according to manufacturer specifications.

### Attention:

Before filling the unit, please note the requirements regarding the heating water and the instructions of the information brochure regarding heating water preparation (art. no. 4798.399.xxx) as well as the iav documentation of VW.

- Fill the unit at a filling station installed on site or at the filling connection (KFE valve) of the SE940 buffer vessels with prepared heating water to approx. 1.8 bar.
- Carefully open and close the various venting valves at the Dachs Pro 20 ST to vent the system.

### Note:

After commissioning, vent at all venting valves again.

- After venting, check if the operating pressure fulfils the requirements (**at least 1 bar**).

### Hydraulic vent positions at the Dachs Pro 20 ST:

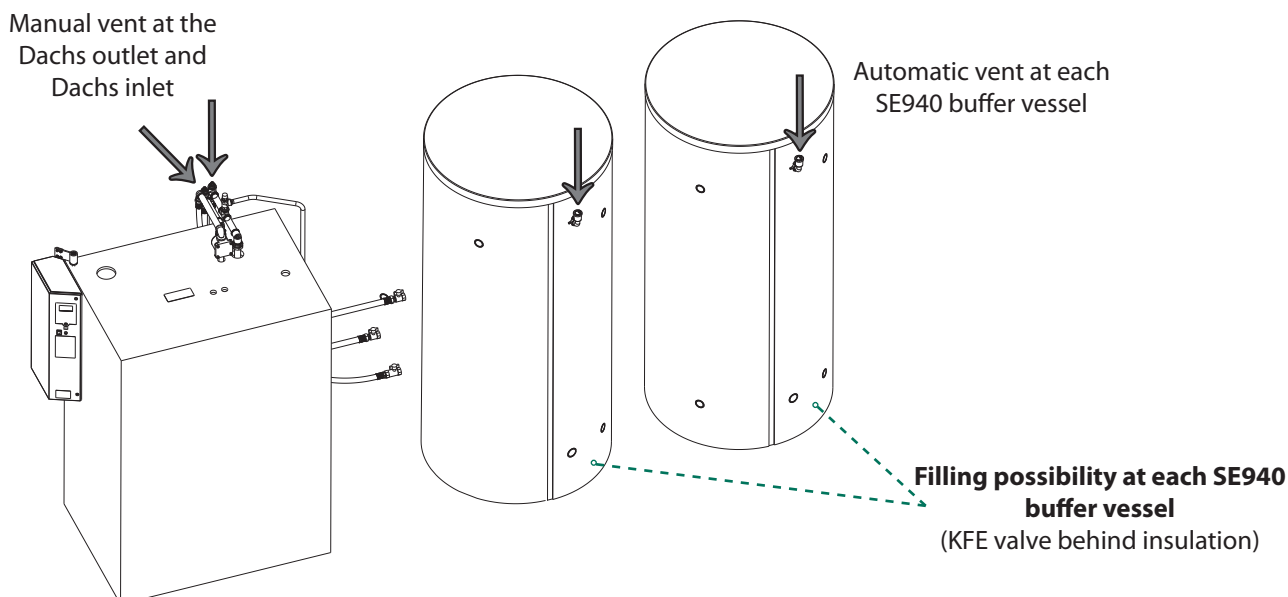


Fig. 95: Hydraulic vent positions at the Dachs Pro 20 ST

### Reference:

For hydraulic installations and venting at the Dachs Pro 20 ST, please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.





### 6.12 Finishing work

- ▶ Assemble the remaining cladding components of the CHP unit.

- Rear cladding (rear wall) ④.
- Right cladding ⑤.
- Front cladding ⑥.  
(under the CHP control unit/main switch).
- Top, centre cladding ⑦.
- Top, centre cladding ⑧.

#### Reference:

For assembly of cladding components, please observe the instructions in the iav documentation of VW on EcoBlue 2.0 (Generation 1.2) - **Chapter 6.2 Basic module installation** in the *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.

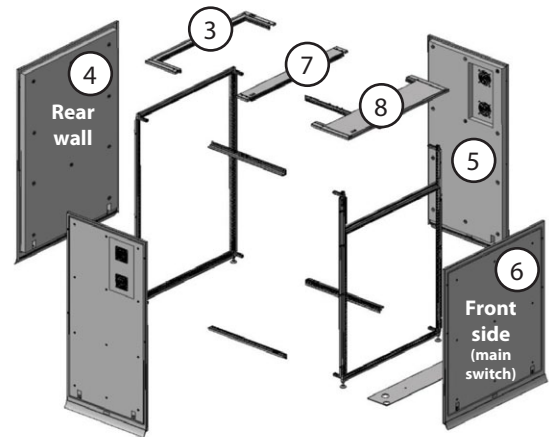


Fig. 96: CHP cladding / frame components

#### Note:

The top rear cladding ③ has only been set on loosely for MSR Pro 20 ST controller assembly and partially secured after controller assembly.

For this reason, the remaining screw connections at the top rear claddings ③ have to be tightened when assembling the remaining cladding components.





## 7 Commissioning

### 7.1 General information

Prior to commissioning, the following requirements are to be met:

- All assembly work has been completed.
- The following check list has been completed.
- The electrical equipment of the unit has been completely installed.
- The consumer loads have been electrically connected.
- The hydraulic equipment of the unit has been completely installed.
- The unit has been filled and vented on the heating side.
- The exhaust gas system has been completely installed.
- The fuel connection has been installed and checked.

#### Attention:



Initial commissioning of the unit may only be carried out by authorised specialist personnel or the SenerTec technical service in the system test phase. Product training carried out by SenerTec or by a training institution commissioned by SenerTec is a minimum requirement. Install the pre-fuses and check the connection in the main and sub-distribution.

**Prior to** commissioning, the following points have to be observed:

- A leakage test according to TRGI has to be carried out at the gas line.
- The exhaust gas system has to be approved by the responsible master chimney sweep, i.e. the authority responsible for inspecting gas installations (in the case of shared chimneys).
- The Dachs Pro 20 ST must have been approved at the responsible distribution network operator with potentially necessary coordination regarding the point of connection to the public grid.

**Only then** may the Dachs Pro 20 ST be commissioned with the installation contractor (contractor for heating/electrical systems, utilities, etc.) and, if required, in the presence of the responsible distribution network operator.

Please observe the duty of notification to the responsible distribution network provider.

#### Reference:



Please observe the instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapter 11 Commissioning** in particular.



## 7.2 Check list prior to commissioning

Check list for the installer regarding the technical installation of the of the Dachs Pro 20 ST		
Operator:		
Dachs ser.-no.:		√ / –
<b>Assembly:</b>		
1.	Has the CHP been aligned with a spirit level?	
2.	Has the overall system been vented on the water system side?	
3.	Has the generator been vented on the water system side (according to iav documentation of VW)?	
4.	Have the buffer vessels been correctly connected to the CHP?	
5.	Have the buffer vessels been correctly connected to the heating system and have the minimum dimensions of the bypass line (DN 50) been complied with?	
6.	Have the sensors (F1, F2, F3, F4) been positioned at the buffer vessels according to specifications?	
7.	Have the vents been installed at the buffer vessels?	
8.	Has equipotential bonding been connected to the CHP unit and the buffer vessels?	
9.	Has the insulation of the buffer vessels been correctly assembled?	
10.	Has the compensation tank been correctly dimensioned and integrated in the system?	
11.	Has the existing heating system been flushed?	
12.	Have all screw connections been checked for tightness?	
13.	Is the installation room properly ventilated?	
14.	Has the MSR Pro 20 ST controller been assembled correctly?	
15.	Has the internal cable harness (CAN bus line) been connected between CHP and MSR Pro 20 ST?	
16.	Has the separate supply (voltage supply) for the MSR Pro 20 ST been installed?	
17.	Have the sensors been connected in the MSR Pro 20 ST (external sensors F1-F7)?	
18.	Has the GSM antenna in the MSR Pro 20 ST been connected and positioned on the controller housing?	
19.	Has the buffer discharge pump been correctly connected in the MSR Pro 20 ST (voltage supply and PWM signal)?	
20.	Has the frequency converter been correctly connected to the CHP (according to iav documentation of VW)?	
21.	Have the CO sensors been correctly connected to the CHP (according to iav documentation of VW)?	
22.	Have the preparatory installations for gas connection (gas filter, fittings, gas hose and gas ball valve) been carried out correctly and connected without tension to the gas supply?	
23.	Have the preparatory hydraulic installations (heating water hoses or CHP outlet and inlet to buffer vessels) been carried out correctly and routed without tension?	
24.	Has the system been checked for tightness (e.g. gas/hydraulic connections)?	
25.	Has the safety valve been assembled correctly?	
26.	Has the exhaust gas system been implemented according to the Raab manufacturer instructions and insulated?	
27.	Has a neutralisation unit been installed for the occurring condensate in the exhaust gas system?	
28.	Has the heating emergency switch been installed?	
29.	Does the heating water correspond to the manufacturer specifications and/or to VDI 2035?	
<b>Visual inspection:</b>		
30.	Has an inspection of the condition and for leakage at flexible hoses, screw connections, gas and exhaust gas lines, oil filling equipment, etc. been carried out?	
31.	Has a visual inspection of the electrical unit, sensors and lines been carried out?	
32.	Has the level of the cooling water level been checked (if necessary, water and anti-corrosion agent is to be refilled and the unit to be vented)?	



Extract from the iav documentation of VW (particularly for the CHP):

Electric installation:		
33.	Have the data of the new CHP been registered with the supplier?	
34.	Is the signal sufficient for wireless modem connection at the installation location?	
35.	Is the supply voltage correct?	
36.	Have the cables been routed and connected according to specifications?	
Fuel supply and connection:		
37.	Is there a natural gas connection according to regulations?	
38.	Has the unit been vented on the gas system side?	
39.	Has the installation been carried out according to the currently applicable regulations at the installation location?	
40.	Has a DVGW-certified thermal shut-off unit been installed?	
41.	Are the shut-off units well accessible?	
42.	Has a gas filter been installed according to DIN 3386?	
43.	Has the gas hose line been properly installed? No pinched lines?	
44.	Have the settings at the gas mixer been carried out according to the gas type at the location?	
45.	Has the inlet pressure been set correctly?	
46.	Has an overcurrent monitor been installed? • Protection function in case of defect or misuse • Monitoring of the minimum admissible operating pressure for fuel supply	
47.	Has a leakage test been carried out?	
48.	Has an external reinforced hose been installed for vibration decoupling to the external gas connection?	
Exhaust gas system:		
49.	Has the exhaust gas system been designed according to applicable regulations?	
50.	If required, has a condensate discharge been installed?	
51.	Has the exhaust gas system been approved by the responsible master chimney sweep?	
52.	Has the exhaust gas system been included into the lightning protection of the building?	
Preparations for commissioning:		
53.	Have all installed components entered into the CHP controller?	
54.	Have the required settings been carried out at the CHP controller? • Date and time check • Operating mode ( <b>automatic</b> ) • Unit status ( <b>unlocked</b> ) • Temperature threshold on ( <b>80 °C</b> ) • Temperature threshold off ( <b>75°C</b> ) • Number of buffer sensors ( <b>4</b> ) • Number of heating circuits ( <b>0</b> ) • Circulation installation ( <b>NO</b> ) • Drinking water storage installation ( <b>NO</b> ) • Heating cartridge installation ( <b>NO</b> ) • Additional oil pump operation ( <b>automatic</b> ) • Primary circuit control ( <b>mot. V3 control</b> ) • P1 power at mot. V3 control ( <b>100%</b> )  • Confirm commissioning ( <b>confirm</b> )	





Additional preparations for commissioning:		
55.	Has the application at the energy provider (EVU) been prepared and sent in time?	
56.	Has the application at the German Federal Office for Economic Affairs and Export Control (BAFA) been prepared and sent in time?	
Comments		
HEATING, executing company		ELECTRICS, executing company
Date _____ Signature _____		Date _____ Signature _____

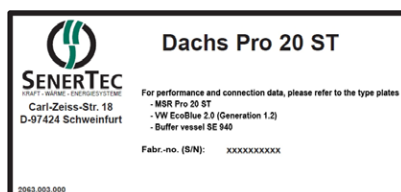
## Reference:

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapters 11.1 and 11.2** in particular.

## Note:

After commissioning, the manufacturer label is to be installed at the Dachs Pro 20 ST overall system.

By attaching the manufacturer label (adhesive label) to the housing of the CHP unit, the installer confirms proper installation of the unit according to the manufacturer documentation and the specified safety instructions. Amongst others, The fabrication number (S/N) specified on the manufacturer label is required for unit identification in case of servicing. Reorders are **not** possible.





## 7.3 Commissioning procedure



### Note:

Control of the unit during commissioning is performed via the CHP control panel and the menu of the MSR Pro 20 ST controller. These instructions only describe the entries required for commissioning.



See also chapters 8 and 9



### Reference:

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

**Chapter 7 - CHP controller settings**

**Chapter 8.8 - Commissioning mode**

**Chapter 11 - Commissioning**

**Chapter 14 - Acceptance protocol - CHP commissioning**

For detailed information on operation of the MSR Pro 20 ST controller, please refer to the *MSR Pro 20 ST operation and configuration instructions*, art. no. 4798.494.xxx.



### Attention:

Initial commissioning of the unit may only be carried out by authorised specialist personnel. Install the pre-fuses and check the connection in the main and sub-distribution.

- ▶ First, switch on the MSR Pro 20 ST at the main switch.
- ▶ Afterwards, switch on the CHP unit at the main switch.
- Line 1 displays:  
-> Commissioning required.
- ▶ Carry out initial commissioning by working through 11/6/2 Commissioning menu step by step.



For a detailed description of the settings to be made, refer to **chapter 7.6 Commissioning settings**.

Not before all settings have been made, the Dachs can be put into operation by pressing the ON/OFF key at the control panel.

- ▶ Press the illustrated button until the green LED next to the AUTOMATIC symbol flashes (top LED).
- The Dachs is then operational.



### Note:

In case of any irregularities during the functional check, after commissioning or during the first days of operation, please contact a SenerTec service partner.



## 7.4 Gas supply settings



### Reference:

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapter 6.9 Gas supply** in particular.

## 7.5 Oil supply settings



### Note:

This chapter is not relevant for the Dachs Pro 20 ST.  
The fuel supply is realised exclusively using natural gas.

## 7.6 Commissioning settings

### 7.6.1 Service level selection and start of MSR Pro 20 ST commissioning

- ▶ In the basic screen, activate the menu selection with one of the control keys.
- ▶ Browse to menu 11 by pressing or and select it with .
- ▶ Browse to menu item 11/06 by pressing and select it with .
- ▶ Start the entering the password with .
- ▶ Set the first character of the password by pressing or and switch to the next character or confirm the entry by pressing . Proceed in the same way for additional characters.

#### Start of commissioning:

- ▶ Confirm the password by pressing to open menu 11/06.
- ▶ Select menu item 11/6/2 and open the commissioning menu by pressing .
- ▶ Press or to browse to menu *Date/time* (11/6/2/1) and select it with .

### 7.6.2 Menu sequence during MSR Pro 20 ST commissioning



### Note:

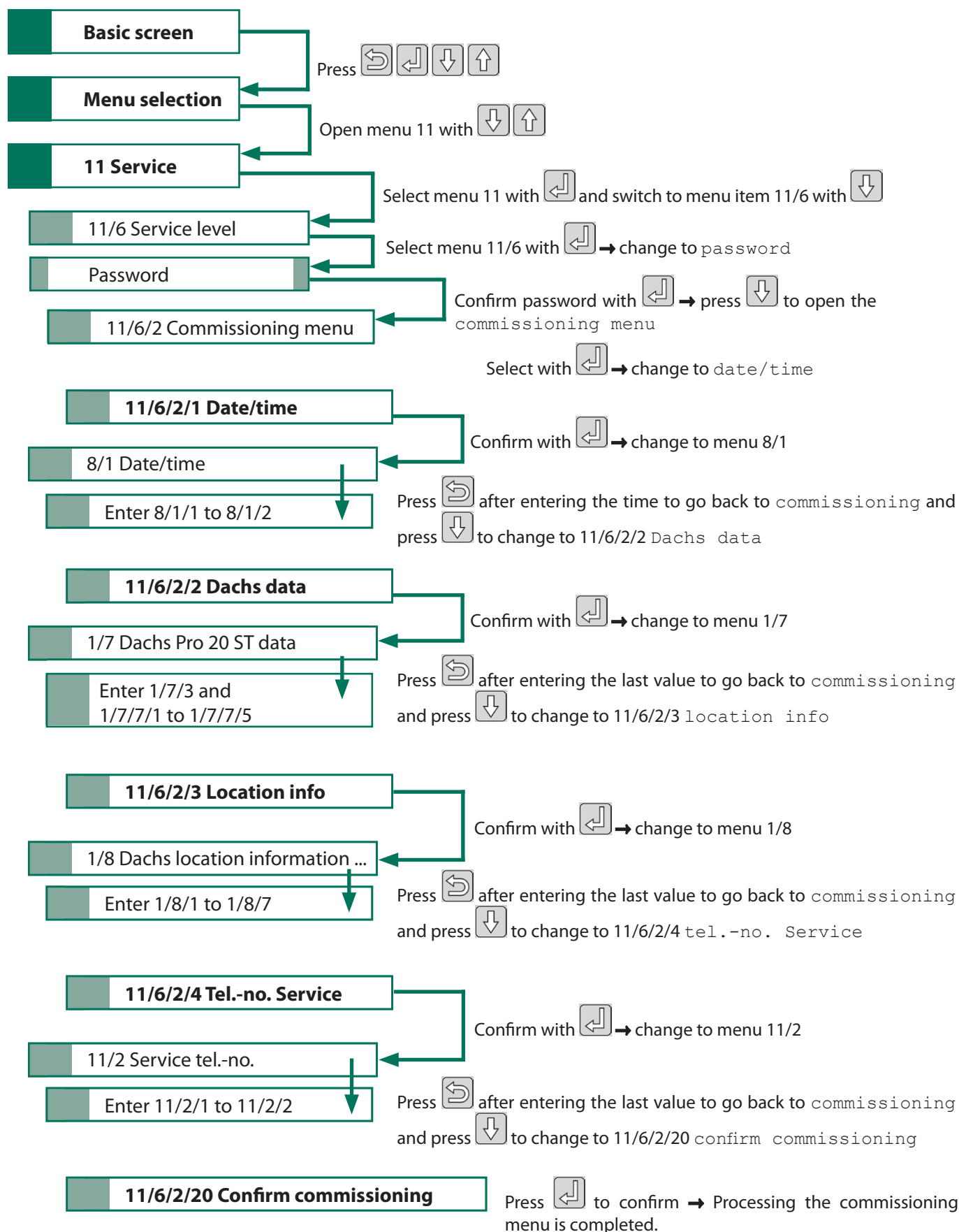
For successful commissioning, the **entire** commissioning menu has to be worked through. This is indicated by check marks behind the respective menu after successful input.

For commissioning, Dachs data (fabrication number etc.) and comprehensive location information (address, phone numbers, e-mail address) are required.



### Note:

The fabrication number can be found on the manufacturer label (adhesive label) at the Dachs Pro 20 ST.



► In the end, check the parameters and settings of the remaining menus of the MSR Pro 20 ST.



### 7.6.4 MSR Pro 20 ST settings in menu 8/1 Date/time

#### Menu 8/1/1 Date

- ▶ Enter the date in format DD.MM.YYYY.

#### Menu 8/1/2 Time

- ▶ Enter the time in 24 hour format.

### 7.6.3 MSR Pro 20 ST settings in menu 1/7 Dachs data

#### Menu 1/7/3 Hydraulic code

- ▶ Check whether hydraulic code "1000" or "3000" is set.

#### Menu 1/7/7/2 Commissioning date

- ▶ Enter the date of commissioning of the Dachs Pro 20 ST.

#### Menu 1/7/7/3 S/N Dachs

- ▶ Enter the 17-character Dachs serial number of the EcoBlue type label.

#### Menu 1/7/8/4 Fuel type

- ▶ Check whether fuel type "natural gas" is set.

### 7.6.5 MSR Pro 20 ST settings in menu 1/8 Dachs Pro 20 ST location information

#### Menu 1/8/1 Name 1

- ▶ Enter name 1. A maximum of 20 characters can be entered.

#### Menu 1/8/2 Name 2

- ▶ Enter name 2. A maximum of 20 characters can be entered.

#### Menu 1/8/3 Street

- ▶ Enter the street. A maximum of 20 characters can be entered.

#### Menu 1/8/4 House number

- ▶ Enter the house number (max. 4 characters).

#### Menu 1/8/4 Post code

- ▶ Enter the post code (max. 5 characters in Germany)

#### Menu 1/8/5 Location

- ▶ Enter the location. A maximum of 20 characters can be entered.



### Menu 1/8/6 Country

- ▶ Enter the country. The country identifier can be selected from a list. If the country is not listed, "other" has to be selected.

### Menu 1/8/7 E-mail

- ▶ Enter the e-mail address. In the first line, a maximum of 14 characters can be entered. In the second line, a maximum of 21 characters can be entered.

## 7.6.6 MSR Pro 20 ST settings in menu 11/2 Service tel.-no.

### Menu 11/2/1 Service: tel.-no. 1

- ▶ Enter the first service phone number. A maximum of 2+15 characters can be entered (The first two digits of the country code "00" are already set by default. Only the last two digits of the country code have to be entered. For example: "49" for Germany. When entering the telephone number, the first digit "0" is not required due to the country code.)

### Menu 11/2/1 Service: tel.-no. 2

- ▶ Enter the second service phone number. A maximum of 2+15 characters can be entered (The first two digits of the country code "00" are already set by default. Only the last two digits of the country code have to be entered. For example: "49" for Germany. When entering the telephone number, the first digit "0" is not required due to the country code.)

## 7.6.7 MSR Pro 20 ST settings in menu 11/6/2/20 Confirm commissioning

- ▶ Commissioning is completed by pressing the confirmation key.

## 7.6.8 Advanced MSR Pro 20 ST parameter settings

- ▶ Check the values in the menus and adjust them to the requirements of the building:
  - 2 Heat demand
  - 3 Electrical demand
  - 7 Modem
  - 8 Miscellaneous
  - 9 Grid



### 7.6.9 Advanced CHP parameter settings

**Reference:**

Please particularly observe the supplementary instructions and information to be observed in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **in general chapter 7 CHP controller settings. The parameters in chapters 7.5.5, 7.5.6 and 7.5.7 in particular must be adapted.**

The following parameters in the menu "Operating settings" **must** be checked and set at commissioning of the Dachs Pro 20 ST:

**Menu 13**

- Operating mode (**automatic**)
- Unit status (**unlocked**)

**Menu 15**

- Temperature threshold on (**80 °C**)
- Temperature threshold off (**75°C**)
- Number of buffer sensors (**4**)
- Number of heating circuits (**0**)
- Circulation installation (**NO**)
- Drinking water storage installation (**NO**)
- Heating cartridge installation (**NO**)
- Additional oil pump operation (**automatic**)
- Primary circuit control (**mot. V3 control**)
- P1 power at mot. V3 control (**100%**)
- Confirm commissioning (**confirm**)

## 7.7 Finishing work

### 7.7.1 Commissioning protocol

**Note:**

The commissioning protocol in the service manual of the unit must **always** be completed.

### 7.7.2 Operator briefing

- ▶ Instruct the operator regarding the safe operation of the unit.
- ▶ Instruct all operators on how to correct simple malfunctions.
- ▶ Inform the operator regarding the required maintenance and service work.
- ▶ Provide the operator with all documents required.



## 8 Operation

### 8.1 General information


**Reference:**

For detailed information on the operation of the MSR Pro 20 ST, please also refer to the original operating instructions:  
*MSR Pro 20 ST operation and configuration instructions*, art. no. 4798.494.xxx.


**Reference:**

For the detailed description of the CHP unit control panel, please refer to the iav documentation of VW.

- *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.
- *EcoBlue 2.0 (Generation 1.2) user manual for Dachs Pro 20 ST*, art. no. 4798.530.xxx.

### 8.2 Control panel

#### 8.2.1 MSR Pro 20 ST control panel and menu structure

- 1 Menu bar
- 2 Control keys
- 3 Generator LED
- 4 Fault clearance key and errorLED
- 5 Chimney sweep key
- 6 Infrared interface
- 7 MSR Pro 20 ST fuse (6.3 A/T, incl. connected system technology)
- 8 MSR Pro 20 ST main switch (incl. connected system technology)
- 9 ON/OFF key, STOP LED, automatic mode LED
- 10 Display

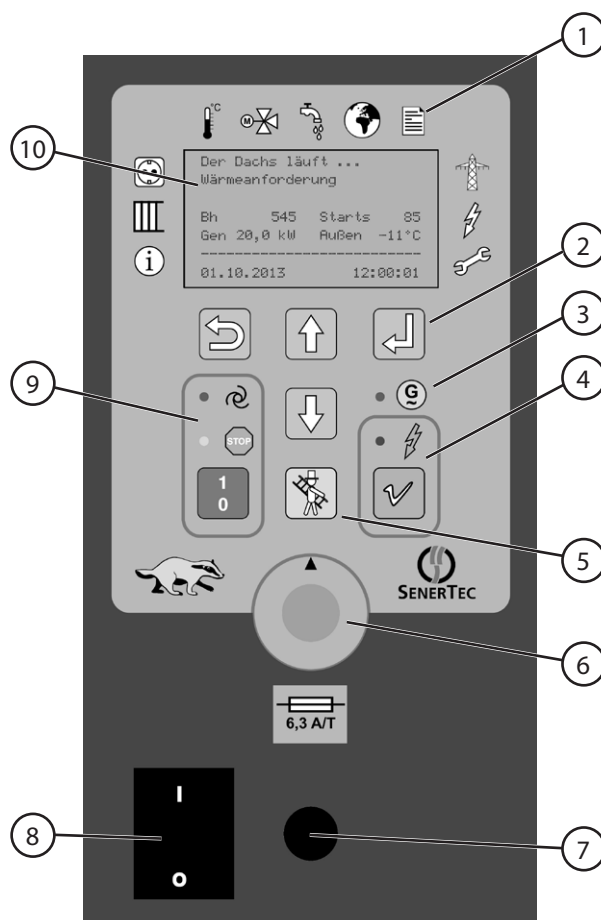













Fig. 97: MSR Pro 20 ST control panel









## Menu functions

	Operating data		Communication
	Heat demand		Settings
	Electrical demand		Grid
	Temperatures		Service code
	Heating circuits		Service
	Domestic hot water		

## Control key function

	back
	up
	confirm
	down

The MSR Pro 20 ST controller is controlled via the key pad. The menu is navigated exclusively with the control keys. The current status is indicated in the display. When selecting a menu point, the respective symbol is marked in the display by means of an arrow. There are three access levels with different access rights. In order of the extended access rights, these levels are:

- **The operator level.**
- **The extended operator level.**
- **The service level.**

## MSR Pro 20 ST menu structure:

<b>1</b> Operating data	<b>1/01</b> Run hours since start <b>1/03</b> Operating hours <b>1/04</b> Starts <b>1/07</b> Dachs Pro 20 ST data <b>1/08</b> Dachs Pro 20 ST location information <b>1/09</b> Pulse input 1 (X4b) <b>1/10</b> Pulse input 2 (X4c) <b>1/11</b> Operating data on 31/12 <b>1/12</b> Show latest shut-downs <b>1/13</b> Current status of actuators <b>1/14</b> Dachs enabling / request
<b>2</b> Heat demand	<b>2/3</b> Set point buffer <b>2/4</b> Hysteresis buffer <b>2/5</b> Heat storage buffer <b>2/6</b> Enable module (Dachs)
<b>3</b> Electrical demand	<b>3/1</b> Elec. demand via internal Timer <b>3/2</b> Elec. demand via external Input
<b>4</b> Temperatures	<b>4/01</b> System technology <b>4/02</b> Dachs


**5** Heating circuits

**Note:**

No "heating circuits" function. The menu is not displayed.

**6** Domestic hot water

**Note:**

No "domestic hot water" function. The menu is not displayed.

**7** Communication

- 7/01** Modem data
- 7/02** Configuration
- 7/03** Service codes sent
- 7/04** Test / status
- 7/05** GSM-diagnostics (radio)

**8** Settings

- 8/01** Date/time
- 8/03** Display brightness
- 8/04** Display contrast

**9** Grid

- 9/01** Generator power
- 9/02** Voltage L1
- 9/03** Voltage L2
- 9/04** Voltage L3
- 9/11** Frequency

**10** Service code

- 10/01** Data of last S.Code
- 10/02** Service codes system
- 10/03** Dachs service codes

**11** Service

- 11/01** Maintenance
- 11/02** Service tel.-no.
- 11/03** Config. in/output
- 11/04** Operator level
- 11/05** Operator advanced level
- 11/06** Service level
- 11/07** Master level

## 8.2.2 CHP control panel and menu structure



Fig. 98: CHP control panel



### Reference:

For the detailed description of the CHP unit control panel, please refer to the iav documentation of VW.

- *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx.
- *EcoBlue 2.0 (Generation 1.2) user manual for Dachs Pro 20 ST*, art. no. 4798.530.xxx.

## 8.3 Start-up

1. Switch on the MSR Pro 20 ST at the main switch.
  2. Switch on the CHP unit at the main switch.
  3. Press the ON/OFF key to set the MSR Pro 20 ST to *automatic* mode (top LED flashing).
- The Dachs Pro 20 ST is now operational.



## 8.4 Shutdown

1. Press the ON/OFF key to set the Dachs to *STOP* (bottom LED flashing).
2. Switch off the CHP unit at the main switch.
3. Switch off the MSR Pro 20 ST at the main switch.

### Reference:

For shutdown, please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

## 8.5 Frost protection

For systems in which temperatures of less than +5 °C might occur, the overall system must be protected from frost at all times. This can be done by taking suitable measures during installation like filling glycol into the heating system or by providing appropriate heating.

### Attention:

For facilities that are not operated throughout the whole year, frost protection has to be considered in detail. The required measures should be clarified between operator and installer when planning the unit.





## 9 Settings

### 9.1 List of parameters

**Reference:**

For the full list of parameters regarding the MSR Pro 20 ST, please refer to:

- *MSR Pro 20 ST operation and configuration instructions*, art. no. 4798.494.xxx.

For the detailed description of the CHP unit control panel, please refer to the iav documentation of VW.

- *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx
- *EcoBlue 2.0 (Generation 1.2) user manual for Dachs Pro 20 ST*, art. no. 4798.530.xxx.

For a selection of the parameters required for commissioning and their application, please refer to chapter 7.6 "Commissioning settings" in this manual.

### 9.2 Setting parameters

**Reference:**

For a detailed description of the unit parameter settings, refer to:

- *MSR Pro 20 ST operation and configuration instructions*, art. no. 4798.494.xxx.
- *EcoBlue 2.0 (Generation 1.2) installation manual for Dachs Pro 20 ST*, art. no. 4798.522.xxx
- *EcoBlue 2.0 (Generation 1.2) user manual for Dachs Pro 20 ST*, art. no. 4798.530.xxx.

**Note:**

The displays and access rights for changing parameters depend on the selected user level (operator, operator advanced level, service level).

### 9.3 Reading out operating data

During the system test phase, the operating data can only be retrieved via the display of the MSR Pro 20 ST controller.

After the software update, operating data can also be retrieved via

- the optical interface (laptop with DachsKOM) or
- the GSM modem (DachsWEB + Dachs Portal).



## 10 Maintenance

### 10.1 General information

The Dachs Pro 20 ST includes several components, but at least the MSR Pro 20 ST, CHP unit, 2 × SE940 buffer vessels, frequency converter and buffer discharge pump.

**Attention:**

Waste operating media and cleaning agents are to be disposed of in an environmentally friendly way.

**Attention:**

For the individual components, please observe the maintenance instructions of the component manufacturer.  
SenerTec can only provide binding maintenance instructions for SenerTec components.

**Reference:**

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

- The Dachs Pro 20 ST including components have to be serviced by specialist personnel at regular intervals.
- We recommend concluding a service contract with a specialist contractor.
- For maintenance, please observe the maintenance instructions and the current maintenance log.
- Lack of maintenance poses a risk.
- Regular cleaning is the requirement for safe, environmentally friendly and energy-saving operation.

After proper assembly, the assembly instructions and further documents are provided in the service pocket at the controller.

- ▶ Check whether the check list in the assembly instructions has been fully completed and signed.
- ▶ If the check list is missing or not completed, please contact the contractor responsible for assembly for clarification.
- ▶ Please note the comments made by the installer.

### 10.2 Maintenance signals

Required maintenance is indicated by the Dachs Pro 20 ST in various ways:

- Maintenance signal on the MSR Pro 20 ST display.
- Maintenance signal in the CHP unit control panel.



## 10.3 Regular maintenance

The Dachs Pro 20 ST including components have to be maintained regularly by authorised specialist personnel according to the maintenance log and recommended servicing measures have to be carried out according to the service manual and maintenance instructions.

**Maintenance is to be carried out at maximum intervals of 3000 operating hours, but at least every two years.**



### Reference:

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

## 10.4 Repair



### Attention:

Repairs may only be carried out by authorised specialist personnel.



### Reference:

The respective repair, replacement and spare parts instructions are to be observed.

# 11 Troubleshooting

## 11.1 Error codes

### 11.1.1 MSR Pro 20 ST error codes

At the MSR Pro 20 ST controller of the Dachs Pro 20 ST, errors are indicated as **service codes** on the MSR Pro 20 ST display and by a red service code LED.

Depending on the service code, there is a defined number of automatic fault clearances. If all automatic fault clearances have been unsuccessful, manual fault clearance is required after the error has been corrected.

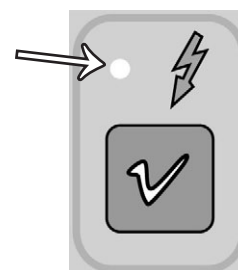
### Red service code LED at the MSR Pro 20 ST:

- The LED flashes constantly if a service code is present.



### Note:

Manual fault clearance is required.



### Reference:

For an overview of service codes, please refer to:  
*MSR Pro 20 ST operation and configuration instructions*, art. no. 4798.494.xxx.



## 11.1.2 CHP error codes

Errors at the CHP unit are indicated as a LED status signal at the EGS and/or error ID or alarm ID in the display of the CHP control panel.

### Reference:



Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapters 8 and 10** in particular.

## 11.2 Error memory

### 11.2.1 MSR Pro 20 ST error memory

The last service codes are displayed in menu 10/2 `Service codes system`.

```
10 Service code
    10/1 Data of last S.Code
    10/2 Service codes system
    10/3 Dachs service codes
```

### 11.2.2 VW EcoBlue 2.0 (Generation 1.2) error memory

### Reference:



Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapters 8 and 10** in particular.

## 11.3 Error finding

If errors are displayed at individual units, please proceed according to the respective manufacturer instructions.

### Note:



In case of faults, you should generally try to identify the affected unit/component and/or exclude potential causes before contacting the responsible service contractor or the manufacturer.

### Reference:



Please refer to the instructions on error finding in the service code table:  
*MSR Pro 20 ST operation and configuration instructions*, art. no. 4798.494.xxx.

### Reference:



Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) - **Chapters 8 and 10** in particular.



## 12 Decommissioning

### 12.1 Decommissioning procedure



**Attention:**

For permanent decommissioning, the unit components, filling and operating media are to be disposed of in an environmentally friendly way. In Germany, the regulations of the German law on recycling and waste management apply. The respective manufacturer instructions as well as local regulations and directives have to be observed.

Decommissioning is distinguished by the following types:

**Temporary decommissioning:**

- Duration of decommissioning: 1 to max. 6 months.
- May be carried out by the operator.

**Permanent decommissioning:**

- Duration of decommissioning: longer than 6 months.
- May only be carried out by authorised SenerTec service partners.



**Attention:**

Before decommissioning of the Dachs Pro 20 ST, it has to run for at least 30 minutes to remove any residual condensate from the exhaust gas system.



**Reference:**

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

**Temporary decommissioning of the Dachs Pro 20 ST:**

1. Switch off the Dachs Pro 20 ST.  
Switch off the CHP at the main switch.  
Switch off the MSR Pro 20 ST at the main switch.
2. Close the shut-off valve at the gas line.
3. Close the heating water feed and return.
4. Take appropriate frost protection measures in the installation room.



**Attention:**

Ensure that the Dachs and the heating system are **not subjected to frost** or ensure appropriate protection measures like filling the system with antifreeze if a frost-free condition cannot be guaranteed.





### Permanent decommissioning of the Dachs Pro 20 ST:

1. Switch off the Dachs Pro 20 ST.  
Switch off the CHP at the main switch.  
Switch off the MSR Pro 20 ST at the main switch.
2. Disconnect the fuses and secure them against reconnection.
3. Attach a clearly visible out of order sign at the Dachs.
4. Close the shut-off valve at the gas line.
5. Close the heating water feed and return.
6. Take appropriate frost protection measures in the installation room.

**Note:**

After decommissioning of longer than 6 months, the unit has to be recommissioned by an authorised service contractor.

### Disassembly and disposal:

**Note:**

The individual material components have to be disposed of at appropriate disposal points according to the applicable law on recycling and waste management (KrW-/AbfG in Germany).  
Disassembly may only be carried out by authorised SenerTec partners.

1. Switch off the Dachs Pro 20 ST.  
Switch off the CHP at the main switch.  
Switch off the MSR Pro 20 ST at the main switch.
2. Disconnect the fuses and secure them against reconnection.  
Recommendation: Disconnect the fuses from the terminals.

**Attention! Danger:**

Even if the main switch is switched off, there may be residual voltage in the controller!

3. Disassemble the electrical installation at the MSR Pro 20 ST and the CHP unit.
4. Close the shut-off valve at the gas line and secure it against reopening. Close the connections after disassembling the line.
5. Extract the lubrication oil via suction and fill the operating media into suitable containers.
6. Close the ball valves at the heating water feed and return. Close the connections after disassembling the lines.
7. Discharge the heating water circuit in the Dachs Pro 20 ST and the buffer vessels.
8. Disassemble the exhaust gas line and close the chimney opening and the remaining exhaust gas line.
9. Disassemble the Dachs Pro 20 ST into its individual components for disposal according to the applicable law on recycling and waste management.


**Reference:**

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

## 12.2 Recommissioning


**Note:**

After extended decommissioning periods, various pumps at the Dachs Pro 20 ST may be blocked. For this reason, the pumps are to be checked for proper function before recommissioning. After extended decommissioning periods, oil carbon deposits may become loose at recommissioning and affect the valve seals. In this case, it may be not possible to start the engine.


**Reference:**

Please observe the supplementary instructions and information in the iav Documentation of VW on the EcoBlue 2.0 (Generation 1.2) in particular.

1. Open the heating water feed and return.
2. Open the shut-off valve at the gas line.
3. Switch on the Dachs Pro 20 ST.  
Switch on the CHP at the main switch.  
Switch on the MSR Pro 20 ST at the main switch.
4. Start the Dachs Pro 20 ST.

## 13 Spare parts

### 13.1 General information

The spare parts offer is subject to continuous modifications and adjustments. For information on currently available spare parts, please refer to your SenerTec service centre or the Partner area on the SenerTec website under [www.senertec.com](http://www.senertec.com).

The information on spare parts provided is based on the latest information at the time of printing.

### 13.2 Spare parts overview


**Reference:**

Information in the Partner area under:  
**[www.senertec.de](http://www.senertec.de)**



### 13.3 Spare parts list

For detailed information on spare parts, please refer to the:

- Product catalogue.
- Spare parts catalogue.
- Partner area of the SenerTec website: [www.senertec.de](http://www.senertec.de).

### 13.4 Sources of supply

Spare parts may only be ordered from local SenerTec service centres. For further information on service centres in your region, please refer to **[www.senertec.de](http://www.senertec.de)**.

## Appendix

### Legal notice

Any warranty claim is subject to proper assembly as well as proper use/operation of the unit in accordance with applicable SenerTec instructions as well as regular servicing by trained and authorised specialists only.

#### Disclaimer of warranty:

In particular for damage which cannot be directly or indirectly traced back to the manufacturer, e.g.: misuse or in the event of:

- Incorrect planning and assembly (e.g. fuel supply, hydraulic and electrical connections, exhaust gas evacuation).
- Commissioning, servicing (maintenance) and repair by buyers or third parties.
- Natural wear and tear.
- Incorrect, improper treatment, alteration, repair.
- Use of unsuitable operating media.
- Use of unsuitable heating water.
- Damage caused by chemical, electro-chemical and electric influences.
- Use of drinking water which does not correspond to the generally accepted rules of practice.

The warranty regulations of the General Terms and Conditions of SenerTec GmbH, Schweinfurt, in their respective current version shall apply.



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## Dachs Pro 20 ST

### Notes:

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